MAY 1927

Electrical West

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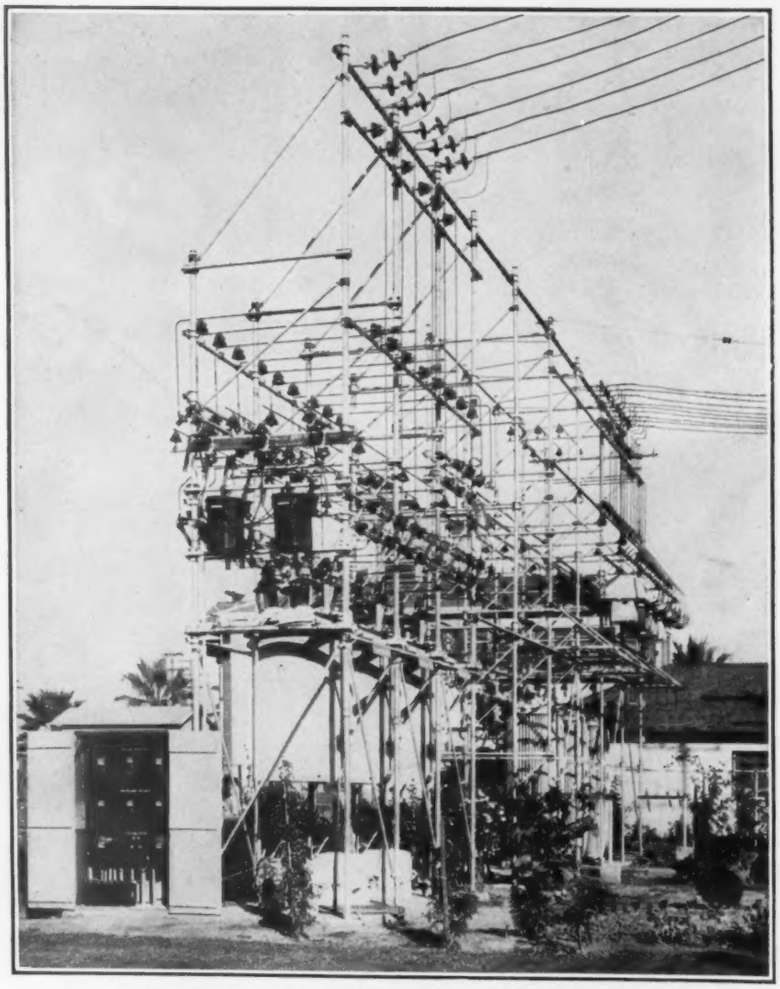
on flexibility in Outdoor Substation Construction



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The Convention Extra

COMMITTEE reports of the Pacific Coast Electrical Association always have been published by the **Journal of Electricity** prior to the annual convention. Last year the same policy was adopted for the Northwest Electric Light & Power Association. The same practice will be followed by **Electrical West** with one change—instead of devoting a regular issue to the various papers, the editors will get out a convention extra. The date of publication has been set as May 15, and the extra will contain reports from the various committees of both of the Western geographic divisions of the N.E.L.A. Placing these reports in the hands of the members at least three weeks prior to the convention sessions affords an opportunity for careful study and for the preparation of suitable discussion. Those who have had the privilege of reviewing the papers agree that they represent the progress of the electrical industry. Every member of every branch of the industry will find much of value and profit in the reports to be published in the next issue, the convention extra.

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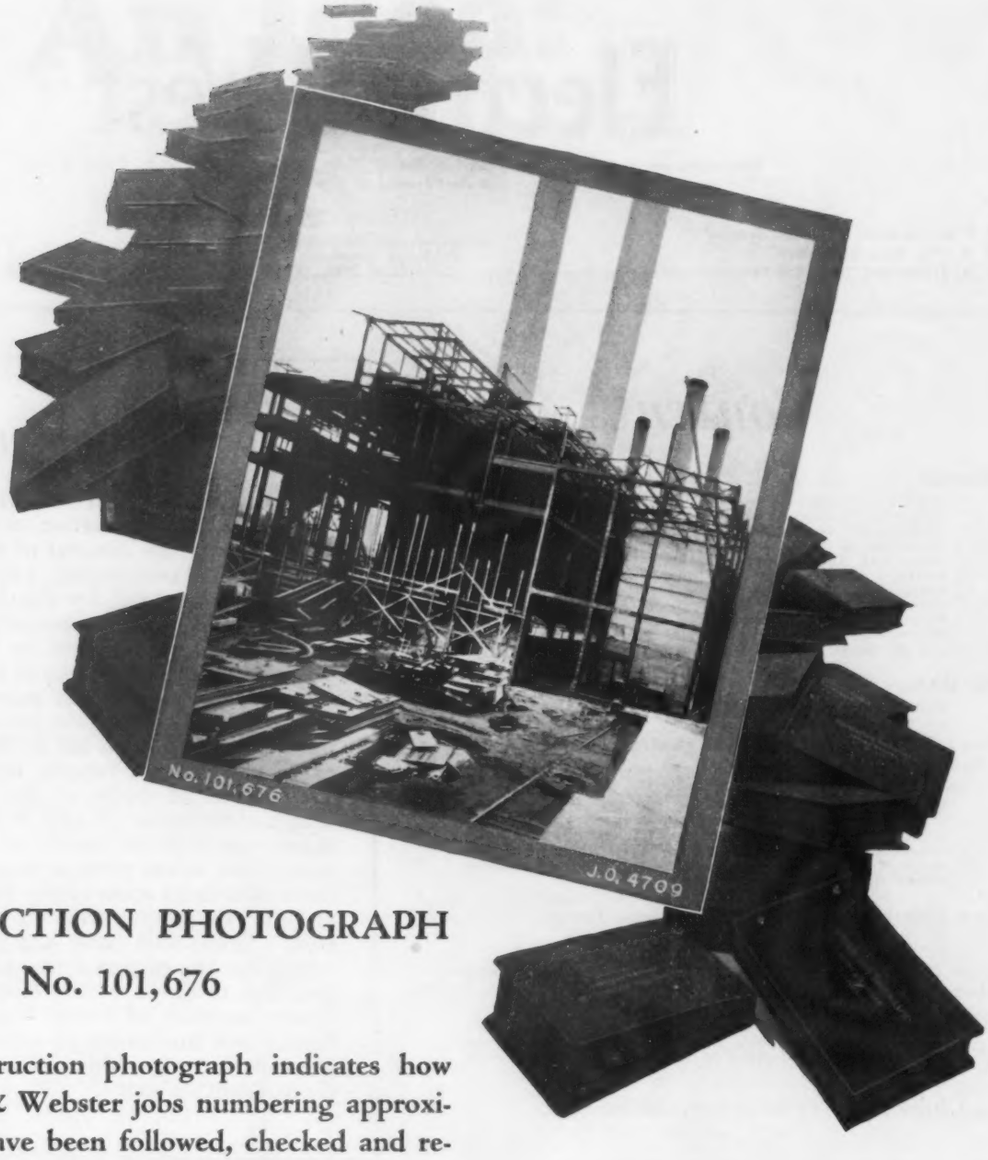

CONSTRUCTION PHOTOGRAPH
No. 101,676

THIS construction photograph indicates how the Stone & Webster jobs numbering approximately 5,000 have been followed, checked and reported to clients during progress. Behind such details is the accumulated experience of 39 years on the construction, reconstruction and extension of steam power stations, water power developments, transmission lines, industrial plants, office buildings and miscellaneous structures.

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C. T. HUTCHINSON, *Editorial Director* — A McGRAW-HILL PUBLICATION — G. C. TENNEY, *Managing Editor*

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Another Western Man Receives National Recognition

SAN FRANCISCO, California, and the West have reason to feel proud of the fact that another member of the local electrical industry has received national recognition. Clyde L. Chamblin, newly elected president of the Association of Electragists International, has been added to the Western roll of honor, with such distinguished names as Franklin T. Griffith, Russell H. Ballard, and the others who have headed the various great national organizations of the electrical industry in the past.

It is another demonstration of the adage that the office seeks the man. Even the barrier of distance between San Francisco and New York did not operate to prevent the selection of a Pacific Coast man for this large responsibility.

The selection of Mr. Chamblin is a great compliment for two reasons; first, because the West has produced a man chosen from the entire country at large as best fitted to discharge the responsibility of this high office, and second, because of the recognition by the East that the barrier of distance was inconsequential in the light of modern rapid communication that can in a second bridge the gap of 3,000 miles of American continent. A better appreciation of this fact will undoubtedly result in having a greater and greater recognition accorded to Western electrical men as time goes on.

Inspectors' Association Pledges Itself to a Uniform Ordinance

ONE of the finest things resulting from a convention this year in point of constructive effort was the adoption of and the pledge of support given to, a uniform ordinance for the cities of California at the recent convention of the California Association of Electrical Inspectors in Oakland. Indeed, this one activity will rank well in the forefront of the many advances in Western industry for some time to come. Carried out to its ultimate purpose it will mean that anywhere in the State of California electrical installations will be subject to the same restrictions and that the standards will be correspondingly as high in one locality as in another. The National Electrical Code, the State Safety Orders and other recognized standards will be incorporated into this ordinanace as embodying the minimum requirements, according to its provisions.

The uniform ordinance was by no means the only constructive action taken by the inspectors at their convention, as a reading of the report of the convention elsewhere in this isuue will demonstrate. It was an unusually workmanlike convention.

The sessions were business sessions in every sense of the word, and the three days of the convention were spent on nothing else. Other important actions were taken, but by far the most far-reaching and most commendable of all will be found, in time, to have been that relating to the uniform ordinance. As a logical sequence to this very able beginning the California Association of Electrical Inspectors will find a commendable labor before it in seeing that every community, every county and eventually the State of California itself adopts this ordinance and puts it into effect.

No Respite from the Advocates of Political Meddling in Business

ANY FEELING of complacency that may have existed among members of the electrical industry because Congress failed to act on the Boulder Canyon Dam Bill and other measures directed at the light and power industry has been rudely disturbed during the last sixty days. Instead of laying down their arms, the so-called government ownership advocates are busily engaged in influencing public opinion, with the idea of using it to their advantage when Congress convenes in December.

As a fore-runner of an active nation-wide campaign to bring about federal government intrusion into the field of business a meeting was held in Washington during March by Congressmen who class as "Progressives" and others to map out plans for a government ownership drive. The names of those in attendance have a familiar ring: Johnson, Borah, Norris, Howell, Norbeck, Nye, Frazier, Swing, Huddleston, ex-Governor Pinchot, Judson King and Basil Manly. The following quotation from press dispatches explains the purpose of the meeting:

"It was decided to conduct an active campaign throughout the country this year by way of distribution of literature, publicity and speech-making for the purpose of awakening the public to alleged designs of the 'power trust' and for the purpose of bringing about legislation at the next session of Congress which will deal with the different phases of the electric power problem.

"In a general way, the cause of government ownership and operation of power projects is to be promoted and that of private ownership and operation, especially when it tends toward monopoly, is to be fought."

While it is possible that public confidence in utility commissions may have been shaken in some sections of the country during the past year and that attacks by certain writers may have created doubt as to the good intensions of certain holding companies, the great mass of voters still look with outspoken disfavor at any attack upon the basic American principle of private initiative and progress. The often reiterated statement that government has no place in business other than in a regulatory capacity has lost none of its fundamental

soundness. The marked improvement in the service of electric light and power companies at rates lower than those that prevailed prior to 1914, and this in the face of increases in every other item in the family budget, demonstrates the success of the principle of governmental regulation of a monopolistic business—a monopoly that is economically logical.

To prevent the public from being humbugged by the campaign promised by the government ownership advocates is the immediate problem of the utilities. Its principal weapons are customer-ownership and the use of the daily press to expound the principles upon which utility business is based and the facts regarding its regulation.

The Future of the Society for Electrical Development

ALTHOUGH, admittedly, it is a long way from the Pacific to the Atlantic, interest in the West is keen as to the possible future of The Society for Electrical Development. In California the California Electrical Bureau has been working for more than a year on the Red Seal Plan through license agreements obtained from the Society, and the announcement of plans for the future is awaited with interest and speculation.

There can be no doubt as to the need for a national society for electrical development of some kind. Just what its functions should be is a debatable subject. It would appear that basically it should act as a liaison body made up of representatives of the four major groups of the electrical industry by which matters of common interest could be discussed and policies determined. The so-called market development plan of the society in its original form presented many features that could not possibly be accepted by a sufficient number of local clubs and leagues to make it even partially operative. Local conditions throughout the United States differ widely, and a national plan of sales promotion, its administration being in the hands of a sort of feudal overlord in New York, was out of the question.

Really, a society for electrical development should be the creature of the local clubs and leagues, not the reverse. It should be a clearing house through which the practices and experience of the local leagues might be collected for the service of all the leagues. Thus the experience of one would be at the service of all, would effect a marked improvement in promotion work, and help to lower costs and better efficiency.

The operation of the federal government is a fair example. Congress in both houses consists of representatives of the states, and a federation of electric clubs and leagues, with a small permanent clerical and administrative force, would appear to offer possibilities worth considering. The finances could be taken over by manufacturers and others engaged in interstate business without imposing upon them an undue obligation.

Undoubtedly the situation with the society is engaging the attention of many leaders of the industry. They have a splendid opportunity to profit from past experience and devise an organization that will place the burden of active field work on each locality according to local needs, make of the society a clearing house for information collected from the field, provide for a representative government from each section of the country, and set up a financial plan by which the money available will be properly budgeted, controlled and contributed by those representatives of the industry that do an interstate business.

Range and Water Heater Surveys Suggest Similar Study of Air Heating

TO START a warm controversy in almost any group of electrical men, ask the question, "What is the future of domestic air heating?" The answers probably would range from the simple statement, "It has none," to a lengthy dissertation on connected load, demand, cost to serve, rates and revenue. Despite wide differences of opinion and in many instances only lukewarm co-operation from the power companies, a surprising increase in domestic and commercial air heating has resulted from the sales efforts of manufacturers and distributors of heating equipment. Particularly in the Pacific Coast states and in Florida there has been developed a growing consumer acceptance of the electric method of heating homes and offices. The many advantages have been more than enough to offset the increased cost caused by rates that in many cases have not been designed to take this class of load into consideration.

There is a small group of energetic optimists in the industry who see a great future for domestic air heating. The progress to date has resulted from their efforts. Their arguments, however, have failed to carry much weight in the quarters where central-station acceptance of this load must start, namely, among the executives. This acceptance could be hastened if a comprehensive study of this load were to be presented to the executives of the light and power companies. The statement frequently has been made that if the electric range survey had been completed fifteen years ago the long period of pioneering with its attendant grief that marked the development of the electric range would have been obviated. This also holds true for the electric water-heating survey now in progress.

Seemingly it is to the best interests of electric air heating to undertake a similar survey as soon as possible. A committee of the N.E.L.A. might be set up in one of the sections where air-heating load is most prevalent and, using the same equipment as has been developed for the other two studies, conduct a survey that would determine the load characteristics of air heating. With such definite information as average demand, diversity and load factor the central stations then could determine if the load were desirable and set up a proper rate for the service. Undoubtedly the air-heating manufacturers would stand ready to assist in conducting such a survey since the results would be of as much interest to them as to the power companies.

In this day of concentration on the development of domestic load every possibility should be considered. Air heating already has demonstrated that it has advantages for which the public is willing to pay. A careful engineering investigation of the characteristics of the air-heating load could not be more timely.

Electrical League of Colorado Has Enviable Record of Progress

IN STUDYING the annual report of a co-operative organization such as the Electrical League of Colorado judgment cannot be passed solely upon the tangible accomplishments that are set down in black and white. In the report for the fiscal year ending Jan. 1, 1927, one reads with interest that members of the staff of the organization made 2,003 calls connected with educational field work; that work with architects, builders and home-owners resulted in the addition of 7,365 out-

lets to new homes and buildings; that the Red Seal Plan has been inaugurated successfully in Denver; that a fourth electrical home was displayed and that 75 luncheon meetings were sponsored by the league. In addition, there were lighting demonstrations, advertising campaigns and a Christmas lighting contest.

Such tangible achievements as these place the Colorado league in the forefront among organizations of its kind. While the members of the electrical industry in Colorado should and probably do feel proud of this record, the intangible accomplishments are the ones that should give the greatest satisfaction. The knowledge that in the five years since its inception the league has brought about a spirit of helpfulness and teamwork; that its work has resulted in a greater public consciousness of the industry's progress; and, lastly, that the league successfully has assumed its obligation to educate and serve, should be its own reward to the men who have devoted their time and effort to the work of the organization.

Data Supplied by Electric Range Survey Should Be Used

IN GENERAL the results of the N.E.L.A. electric range survey have been accepted throughout the country as a basis for allocation of that part of a utility's investment in plant, transmission and distribution equipment properly chargeable to range load and for the determination of distribution facilities to serve a given number of ranges in any locality. Independent checks made in widely separated sections show that the data in the range survey are applicable anywhere in this country.

At a recent gathering of distribution engineers discussion centered around transformer capacity necessary to serve blocks of ranges. One engineer cited the practice on his own system which checked with the results of the survey, while a second remarked that it was his practice to allow a transformer capacity twice as great. There is no reason for such a wide divergence and for such an obvious failure to make use of the data available.

The purpose of the survey was to gather data that would settle for all time such controversial points. Almost $20,000 was spent in this work. The results when announced were acclaimed loudly as providing at last material that would stabilize range practice and enable the central stations to push electric cooking to a point where it would be almost universal. The survey will accomplish no good if tucked away in the files unread and unstudied. It is worthy of the careful consideration of every executive, every rate-making expert, distribution engineer and commercial manager concerned in the development of electric cooking load.

Discounts or Golf, Results Were the Same

OBJECT lessons frequently succeed where other means fail in bringing about a proper appreciation of things as they are. A short time ago a manufacturer of national repute was experiencing an attack of fidgets due to price fluctuations in the raw material market. This condition affecting his prices for the finished product, he was changing trade discounts in rapid succession. At least once a week, and oftener, out came a new discount sheet, with the result that his distributors were standing on their heads, not knowing when to buy, when to sell, and what the prices would be when the goods were delivered.

The manufacturer's district sales organization ran itself ragged in an effort to keep pace, and at the same time nearly wore out the telegraph and telephone trying to bring about a reasonable degree of stability in discounts.

Then came a meeting of the sales staff, an annual event, and the leaders put their heads together in order to devise ways and means of bringing to the home-office dignitaries an appreciation of the situation. Finally a scheme was concocted that in point of originality caps the climax. As is customary at such meetings, a golf tournament was held. The handicapping committee did its duty, and, after the ensuing debates on this always interesting subject, handicaps were established and the golfers began their rounds.

When the first foursome reached the fourth tee it was waited upon by a small committee, which gravely informed the perspiring athletes that due to changing conditions it had been deemed necessary to alter all handicaps, and then proceeded to deduct strokes in terms of some weird compound discount. All players were subjected to the same treatment, a process which was repeated three times more before the round was finished. All you golfers who read this may imagine the situation. By the time the third alteration in hadicaps was made, even the dullest began to sense the situation, and the whole party ended in a hearty laugh. The golf tournament was wrecked. The policy of discounts was changed, and it is related that they all lived happily ever after. All of which goes to prove that there are many ways of skinning a cat.

Electrical Contracting Is not the Only Hazardous Business

SOMEHOW or other the impression is general that the electrical contractor as a class is not much of a business man. Figures are quoted from time to time purporting to show that the mortality among contractors is way out of proportion to other classes of business; estimates range from 25 per cent to 35 per cent of the total number of contractors in business who will have failed within twelve months.

These figures, if accurate, do indeed indicate a serious state of affairs, but how do they compare with other businesses, and with business in general? A study of the corporation income tax returns is interesting. A few items culled therefrom give food for thought. In 1924, a good business year, 181,032 corporations showed a *deficit*, or 43 per cent of *all American corporations*. Twenty years ago this proportion was 80 per cent.

Of the 236,389 corporations that made a profit during that year, 170,175, or 72 per cent, made a profit of less than $10,000, while 69 per cent of all the business profit in the United States is made by only 8,846 companies and firms, or only 2.1 per cent of the total number. Again, 162 corporations, but .04 per cent of the total, make 29.1 per cent of the profits. Incidentally, each of these 162 fortunates makes over $5,000,000 per year. If there are added to the corporations that make no profit at all the corporations that make $5,000 per year or less, there is the astounding total of 335,217 out of the 417,421 corporations in the United States.

So much for that. These figures are given for the purpose of showing that all business is hazardous; many try and few achieve more than a mere pittance. The electrical contractor differs little, if at all, from men in other walks of life.

The Highest Head Plant in America

Balch plant of the Kings River hydro-electric project of the San Joaquin Light & Power Corporation now holds the record of having the highest operating head of any plant in America, 2,243 ft. Another interesting thing about this plant is its location across the river from its penstock pressure line, a feature novel in this country, but resorted to in several European installations.

Kings River Plant Added to Central California Power System

By J. W. Jourdan

Designing Engineer, San Joaquin Light & Power Corporation, Fresno, California

THE 33,000-kva. Balch plant of the San Joaquin Light & Power Corporation was completed and dedicated to public service Jan. 29, 1927, almost exactly 22 months after construction was authorized. Construction economies effected by the San Joaquin men in active charge of this project make it one of the most outstanding hydro developments on record.

ULTIMATELY, 373,000 kw. will be developed on the north and west forks of the Kings River according to the development plans of the San Joaquin Light & Power Corporation. The project consists of 4 storage reservoirs with a capacity of 306,000 acre-ft., 9 power plants, 14 dams of various types and 40 miles of conduit most of which will be pressure tunnel.

Balch is the largest of the projected plants in the Kings River development. It lies practically in the center of the development and at a distance of only 39 miles from Sanger substation at the heart of the distribution system. This combination of circumstances is remarkable and different from the usual condition obtaining in the West where large sources of power are far removed from the market and involve the expense of long-distance transmission. Another feature of especial interest is the fact that the power house is located on the opposite side of the river from the penstock line, the only power house in America so located.

In 1923 a 120-kv. double-circuit steel tower line carrying one circuit of 397,500-circ-mil aluminum conductors was built from Piedra to Balch Camp, a distance of 21 miles, for the purpose of supplying power for construction. Subsequently the line was extended to the power house and to Sanger substation and now carries Balch power into the system. The second circuit will be added when required.

For the present the plant will be operated on a stream-flow basis. Therefore it was of primary importance to select a power house site offering a good pipe-line location and one requiring a relatively short tunnel. After storage is developed the output of the first unit will be increased greatly and it will be economical to install additional units.

The location selected made possible the development of 1 ft. of static head for each 8.12 ft. of tunnel. The ratio of static head to penstock length is 0.4878 and the ratio of computed net head to static head is 0.942. The above values are useful for comparison, and are indicative of the economy of the project layout, especially with only one or two units installed. The penstock line, besides having a comparatively short slope length, has the further advantage of being steepest in the lower parts thus decreasing the length of the heavier pipe.

Water Resources

Kings River rises high on the western slope of the Sierra Nevada and has three main branches: the Middle, South and North Forks. The corporation now has permits from the state division of water rights and licenses from the Federal Power Commission covering the entire resources of the North Fork and its principal branch, the West Fork, commonly known as Dinkey Creek. Larger reservoir capacities in the upper elevations, closer proximity to load center, and very steep stream-bed grades are the outstanding advantages of the north branches of the river. Because of superior storage facilities and certain other economic advantages it is planned to develop at least the principal plants on the North Fork before developing any on the West Fork. It may be noted in the accompanying project profile that 7,290 ft. of head will be developed between Helms reservoir at El. 8,170 and the proposed Pine Flat reservoir of the Kings River Conservation District at El. 880.

Preliminary surveys were started in 1917 and now level circuits based on sea-level datum have been run and benches established throughout the entire area. Studies of water resources were made in a crude way until standard gaging stations could be built. Now there are eight such stations built by the corporation and operated in conjunction with the U.S.G.S. Hydrographers keep meteorological records in co-operation with the U.S. Weather Bureau and make snow surveys in addition to collecting stream-flow data. Six of the stations are located above El. 6,000.

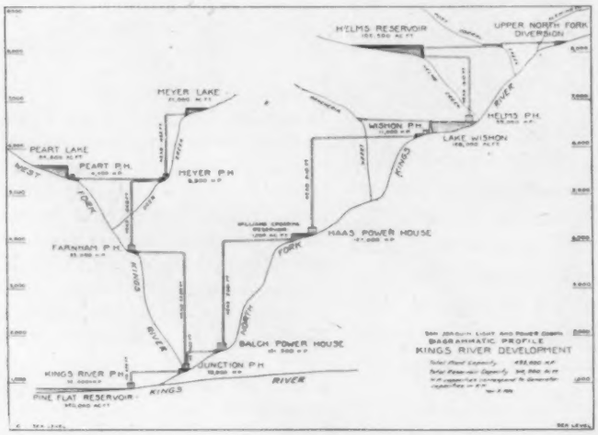
The entire area is of granitic formation with a few lava outcroppings and other slight deviations from the prevailing gray granite. Distinct indications of glacial action are in evidence. Except for the upper elevations, which reach a height exceeding 12,000 ft., a good cover of brush and timber prevails.

Roads and Construction Camps

Preliminary surveys and comparative estimates showed the economic advisability of building a road for truck haul instead of a railroad. The town of Piedra on the Santa Fe about 28 miles from Balch Camp headquarters is the nearest rail head. The headquarters camp is located 55 miles east of Fresno. A total of 33 miles of new roads has been built by the corporation, 12 miles of road rebuilt, and 13 miles widened. This road system extends to the Wishon dam site and connects with various points at which development work will be carried on in the near future along the North Fork. Six bridges and several trestles were constructed. The width of road bed varies from 14 to 16 ft. in cut. The road between Balch Camp and the Wishon dam site is built on a continuous 6-per-cent grade for a distance of 20 miles and an additional 5 miles on nearly level grade. An Erie caterpillar steam shovel, 5 Ingersoll-Rand gasoline-engine-driven compressors, one air receiver mounted on wheels, steel sharpener, jackhammers, etc., were used in road construction.

Construction methods were carefully worked out and proved to be very successful with the equipment selected. The road camp provided for 50 men and consisted of tent houses built up of wooden panels and canvas. After the completion of each three miles of work the camp was moved ahead.

The greater part of the highway was constructed through solid rock and in some places it was necessary to build along nearly vertical cliffs. In many places



Diagrammatic profile of King River project.

the rock slopes were so steep and smooth that it was necessary for the drillers to work suspended on ropes in some instances 200 ft. long. Some of the cuts are more than 100 ft. deep and in two places trestles were built rather than to try to obtain a bed. In spite of the hazardous working conditions no accidents occurred.

Before actual construction was commenced it was necessary to establish camps at six different points on the job. A 30,000-board-ft. saw mill was built and used to produce lumber for the construction of camps and for form work. Kitchens were provided with heavy-duty hotel-type electric ranges and electric water heaters, both of which proved to be successful and more economical under the prevailing conditions than any other type of range. Thirteen of these ranges were used and it was found that labor conditions in the kitchens and dining rooms were improved by their use. At the headquarters camp, known as Balch Camp, a hospital, public school, branch library, commissary store, warehouses, machine shop, garage, ice plant, field offices, barber shop, etc., were established. Sanitation, water supply and fire protection were provided for all camps.

Diversion Dam and Intake

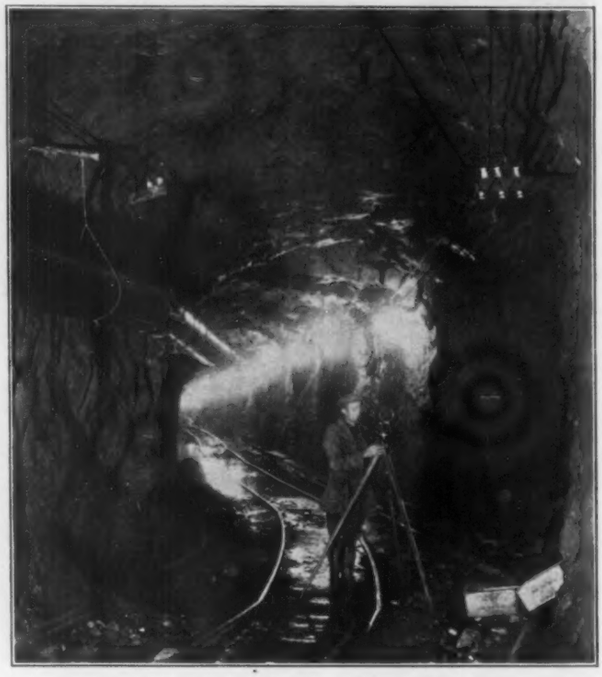
A constant-angle concrete-arch dam built to an initial height of 60 ft. provides a net pondage of 104 acre-ft. Eventually the dam will be raised to a height of 110 ft. increasing the capacity to 1,200 acre-ft. Two 30-in. sluice pipes controlled by manually operated slide-gates are installed, but no spill control will be installed until the radial gates are mounted when the dam is raised to its ultimate height. The dam is provided with copper-sealed vertical contraction joints placed 50 ft. apart. A copper seal also has been provided in the crest of the initial dam to prevent leakage past this horizontal plane when the dam is raised.

River-bed excavations necessitated the removal of gravel and boulders to a depth of 25 or 30 ft. before bedrock was exposed. Several large pot-holes were uncovered, the deepest of which was nearly 40 ft. below the original stream bed. These formed a natural rock keyway for the bottom of the dam. In the initial dam 5,000 cu.yd. of concrete were placed and about 9,000 more will be placed when the dam is raised.

Initial construction of the intake tower provides concrete slide gates which will be used for the present and which will serve later as standby gates. A 24-in. bypass gate is provided for filling the tunnel and producing a condition of balanced pressure before the main gates are opened. Trash racks consist of galvanized steel bars spaced 2 in. in the clear and are supported upon I-beams the ends of which are imbedded in two vertical walls built forward of the tower structure. Rack bars are made up in removable sections.

Pressure Tunnel

The Balch tunnel is unlined for its entire length of 19,348 ft. except for 125 ft. at the intake portal, part of which is through blocky material lying under the reservoir. The section is 12 x 12 ft. and the roof is slightly arched. The tunnel invert is laid on a constant grade of 0.0033, sufficient to take care of friction head with the full tunnel discharge of 720 to 800 sec-ft., assuming $N = 0.035$ in Kutter's formula. Therefore the tunnel will be under a constant pressure from beginning to end and can be operated safely with only sufficient head at the intake to provide for gate losses. Two 8 x 12-ft. construction adits, each 365 ft. long, have been



Interior of main Balch tunnel.

plugged with concrete and provided with 72-in. removable steel bulkheads and 20-in. manholes to permit ready access to the tunnel for inspection.

In driving the tunnel five headings were used, two double and one single and the longest tunnel section was 8,600 ft. The two double headings were contracted. However, the San Joaquin Light & Power Corporation furnished all equipment, operated the camps, carried the insurance, and provided all hospital facilities. All expendable supplies such as powder, machine parts, drill steel, etc., were furnished by the corporation and the cost deducted from the amount due the contractor. The corporation installed a shop and provided all equipment —in fact everything complete preparatory to actual

driving. The single heading at West Portal and all of the approach cuts were driven by corporation forces.

The following equipment was used in the tunnel:

Five St. Louis shovels; seven Mancha battery locomotives; 3-yd. Koppel steel cars, special tunnel type; Ingersoll-Rand R-72 Leyner drills; Ingersoll-Rand compressors; Ingersoll-Rand drill steel; Ingersoll-Rand sharpening equipment; Root No. 4 blowers; Western Pipe & Steel 16-in. diam., 16-gage, blower pipe; 52-lb. rail for 36-in. gage track; 4-in. airline; 1¼-in. water line.

Drill carriages were developed and also an improved type of air-lift for switching cars behind mucking machines.

A surge shaft was excavated from solid rock near the lower end of tunnel, and offset 30 ft. from the tunnel center-line. It was designed to care for pipe-line surges not only for the present single generating unit, but also for the ultimate installation of four units. The main shaft is 16 ft. in diameter with the top and bottom enlarged to 30-ft. diameter.

Penstock

Measured from the butterfly valve at head of line to the gate valves in the power house the penstock has a slope length of 4,882 ft. The upper 2,596 ft. is plain welded steel pipe and the lower 2,286 ft. is reinforced or banded pipe. Pipe diameter varies from 60 to 48 in. in the main line and is 34 in. in each of the two lower 300-ft. branches. A motor-operated butterfly valve at the head of the line is designed for remote control and may be closed from the switchboard in the power house.

Method of handling penstock pipe.

Also it may be stopped and reversed in any position, but is so arranged that it cannot be opened from the switchboard from the fully closed position. The control design permits testing out the operation of the valve from the power house, but eliminates the hazards of opening by remote control. A hand-operated by-pass valve is provided for slowly filling the line to equalize pressures before opening the butterfly valve. The pipe is supported on concrete piers, and heavy concrete anchorages are provided at bends.

Among other appurtenances the pipe line is provided with a 36-in. air-inlet standpipe, manholes, three sets of 6-in. air valves, and an expansion joint below each bend. A venturi meter in each of the 34-in. lines is calibrated to indicate and record the discharge in sec.-ft. and to give the totalized flow in acre-ft.

Penstock crosses river in concrete block.

Minimum thickness of plate in the plain welded or core pipe is ⅜-in. Where the pressure head requires a plate thickness of 1 3/16-in. or greater, seamless steel bands are shrunk accurately on the core pipe. Single and double-riveted bump joints are used in the upper part of the line and riveted butt-strap or band joints in the lower part and in the banded section. Each length of pipe was shop tested to a pressure equal to 1.65 times normal working pressure and the cast steel bands were tested to twice the working pressure.

Owing to the steepness of the canyon there was no room for the power house on the penstock side of the river. This condition made it necessary to carry the penstock line across the river. The method finally chosen was to embed the pipe in solid concrete laid in the river bed. This concrete anchorage has been finished to an ogee section on the downstream side to facilitate the river flow. Placing the pipe in the bed of stream was considered safer and in the long run more economical than an overhead crossing with the pipe supported in the form of an arch or on piers as a beam.

The penstock grade was cleared and excavations made for the anchors for the ultimate installation of four lines. All loose material has been removed to eliminate danger from rolling rocks. As a further precaution a deflecting concrete wall has been constructed to one side of one of the steepest slopes and 200 ft. of extra-heavy wire-net fence on 6-ft. concrete posts placed across the two steepest slopes, which occur in the lower third of the line. The pipe is embedded in concrete for a distance of 114 ft. back of the river crossing to protect from possible falling rocks.

All but the lower 1,200 ft. of pipe line was built from a standard gage incline railway operated by a hoist at the head of the line. In building the lower and steeper part of the line a specially constructed 8-ft.-gage gantry car was used supported on trestle work and straddling the line. Tools and men and some of the lighter pipe accessories were handled by means of a high-line cableway.

An electrically welded steel manifold at the lower tunnel portal provides for the present penstock and for three future penstocks. The manifold is entirely embedded in concrete and extends into the tunnel 65 ft. beyond the portal arch. A 24-in. gate valve and sluice pipe provides a blow-off for the sand trap at the tunnel portal. In the tunnel just below the sand trap and ahead of the concrete transition section to the steel manifold a trash rack is placed to catch any debris that might pass the tunnel intake racks or be picked up in the tunnel. It is exceedingly difficult to clean up thoroughly and wash out an unlined tunnel. When additional units are installed the tunnel will have been washed sufficiently clean by use to justify the removal of the inside rack structure without danger to penstocks or water wheels. Loss of head is an element to consider in the use of a rack structure at the lower end of a tunnel, but in this particular case this loss is not serious with only one or two units installed. With the addition of units up to full tunnel capacity the loss of head would increase materially.

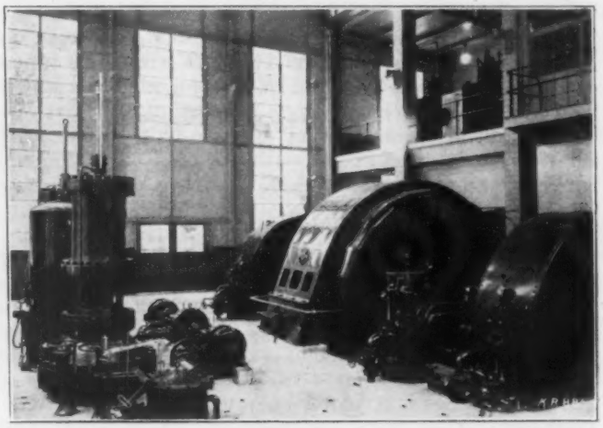
After investigation and comparison of costs it was decided to have all rack-steel galvanized with the exception of structural steel supports which of course are painted after erection. The cost of galvanized rack bars made up in conveniently handled sections was very little more than black steel sections painted or dipped.

Six-inch air valves in main penstock.

Hydraulic Equipment

Designed for a discharge of 180 sec-ft. at a static head of 2,381 ft. and a net head of 2,243 ft. the first unit now in operation will develop 40,000 hp. at a speed of 360 r.p.m. However, it is capable of being operated with a discharge of 200 sec-ft. and developing 44,000 hp. The unit is of the double-overhung horizontal-shaft type, each wheel developing 20,000 hp. from a 7⅛-in. jet flowing 370 ft. per sec. The 11-ft. bucket wheels are bolted directly to flanges on the ends of the shaft. It may be of interest to note here that at 360 r.p.m. the 22 buckets receive a total of 132 61,000-lb. impulses per sec., practically a smooth transfer of power from jet to wheel.

Bearings are 22 in. in diameter and 64 in. long, water cooled, self-aligning, and oil-ring lubricated. Lubrication of parts in contact with the operating water pressure of 1,030 lb. per sq.in. is obtained by means of a differential piston-type grease compressor operated from penstock pressure. The compressor is charged by means of a grease gun actuated by air at 100 lb. per sq. in.



Interior of Balch power house.

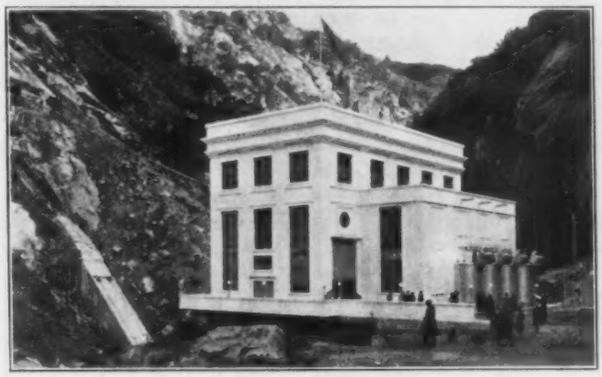
A hydraulic brake is provided for each wheel, a small hand-controlled nozzle that directs a jet against the back of the buckets. Water is taken from the main nozzle pipe at penstock pressure through a high-pressure cast-steel gate valve.

Each needle valve is operated directly from a servomotor controlled by an oil-pressure actuator type of governor. Thus each wheel is controlled independently, adding to the safety of the unit. Each governor is mounted close to its respective wheel and the flyballs are belt-driven directly from the main shaft. Flyballs are of the balanced-spring precision type, completely encased and automatically lubricated. Each governor is equipped with synchronizing, load limit, and solenoid-trip devices which may be operated from the switchboard. Rate-limit device and governor trip actuated by belt failure are not controllable from the switchboard.

As the governors are designed to shut off the water in a very few seconds thus inducing excessive pressure rises in the line, a pressure regulator having full discharge capacity is provided for each wheel nozzle. They are so connected to the governors that when the latter causes rapid valve closure the regulators open synchronously and discharge the water into the wheel-pits thus obviating any appreciable velocity change in the penstock. A dash-pot arrangement closes the pressure regulators at a predetermined rate to reduce the wastage of water. A rise in pressure, such as that which might occur from the sudden stopping of flow due to lodgment of some obstruction in the nozzle throat, will cause the regulators to function independent of governor action. Pressure supply for the regulator control valves is obtained from an independent 3,000-gal. tank located on the hillside and connected to the pressure regulators by a 5-in. pipe line.

Governors for both the main unit and the exciter wheels are supplied with oil for their operation from a

central pressure system. The primary elements of this system are two rotary helical gear-type pumps. These pumps are arranged in tandem and each is directly coupled to a 60-cycle, 3-phase induction motor. Between the two is a small impulse wheel which may be clutched to either pump. Oil is picked up from a receiver tank and delivered into a pressure tank supplying the governor actuators at a pressure of about 150 lb. To economize in the power required for supplying



Exterfor view of Balch plant.

this oil pressure an unloader system is used. Thus, when the maximum desirable pressure is obtained in the tank the unloader opens and permits oil to circulate directly through the pump and back into the receiver with no power demand on the pump. An auxiliary motor-driven air compressor having a capacity of 17 cu.ft. per min. is used to keep the oil pressure tank constantly charged with air at 150 lb.

Installed in each penstock is a 32-in. high pressure, cast-steel, hydraulic-cylinder-operated, single-disc, flanged gate valve designed for an operating pressure of 1,500 lb. per sq.in. These valves are located in the power house building so that they may be handled by the crane. A manually operated balanced-needle-type by-pass valve operated at penstock pressure is provided for each gate valve. The valves may be closed from the switchboard.

Electrical Apparatus

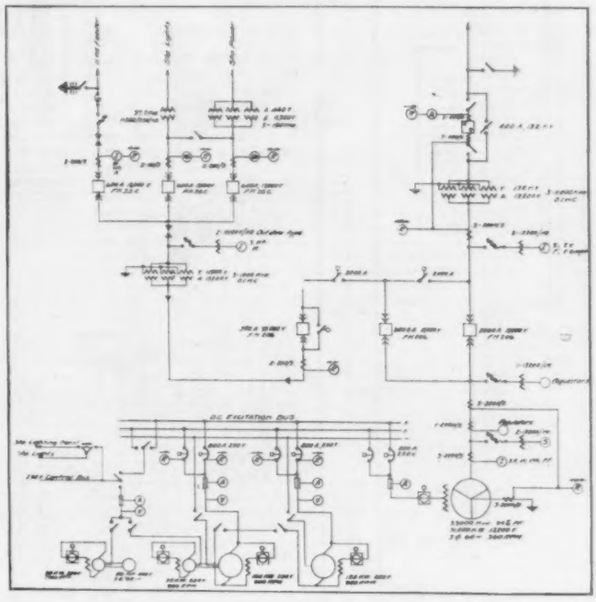
The generator is rated at 33,000 kva., 360 r.p.m., 13.2 kv., 3 phase, 60 cycles and is operated with the neutral grounded. The rotor spider is built up of discs approximately ½ in. in thickness and 8 ft. 5 in. in diameter. It was received in four sections, two 12 in. thick weighing 9 tons each and two 24 in. thick weighing 21 tons each. In placing the rotor the shaft was placed on end in a pit permanently provided for the purpose and each rotor section shrunk on separately. The sections were heated by means of 220-volt bake-open elements in an asbestos lined box. This method was very satisfactory and required only about 18 hours to heat one of the larger sections. The complete generator rotor weighs about 103 tons.

Air for cooling the generator is drawn from the tail race and is discharged outside of the building through two concrete tunnels beneath the nozzle-pit floor. Eliminators are provided to remove all free or unabsorbed moisture and solid matter from the air before it reaches the generator. The generator pit and air discharge ducts are drained to a central sump from which the water is discharged out of the building by two automatic sump pumps. Other cooling systems were investigated but discarded because of foundation difficulties and operating costs.

Each of the two 125-kw. 250-volt exciters is of sufficient capacity to excite the main generator. One is driven by a 200-hp. single-jet, single-over-hung impulse water wheel and the other by a 250-hp. wheel. The latter unit has a 30-kw. 250-volt, d.c. generator direct connected to the exciter. Each of these wheels is controlled by a Woodward oil-pressure governor, oil taken from the main pressure system. Investigation showed that to use direct-connected exciting would introduce operating difficulties incident to shaft deflection. Further, the first cost of 360-r.p.m. exciters was higher than that of 900-r.p.m. machines and would require 8 ft. additional length of building. These facts and the greater flexibility of separately driven units caused selection of the latter.

Power for operation of circuit breakers and auxiliary apparatus is furnished either by a 30-kw. 250-volt motor-generator set or by the 30-kw. generator driven by the exciter water wheel. The probability of the penstock being empty and outside source of power cut off at the same time is very remote and therefore storage batteries were not installed except for telephone and for temperature alarm circuits.

The 3,000-kva., 13.2/11.5-kv. local power bank is supplied from the 13.2-kv. generator bus as shown in the accompanying wiring diagram. This bank also serves as a business protector reactor. The 11.5-kv. power is transmitted through a 4/0, 3-conductor lead-covered



Single-line wiring diagram.

cable to the service bus in the electrical gallery. This bus serves one outgoing 11.5-kv. feeder, one 37.5-kva. lighting transformer and a 450-kva., 440-volt station power bank. Truck-type breakers are used.

Low-tension transformer leads and generator bus consist of three ¼ x 3-in. bars per phase and are connected directly to the generator leads. The generator bus is supported in the cold-air duct by 45-deg. bus supports having 25-kv. outdoor-type insulators. Medium-duty bus supports with 5-in., 25-kv. insulators are used in all cell structures.

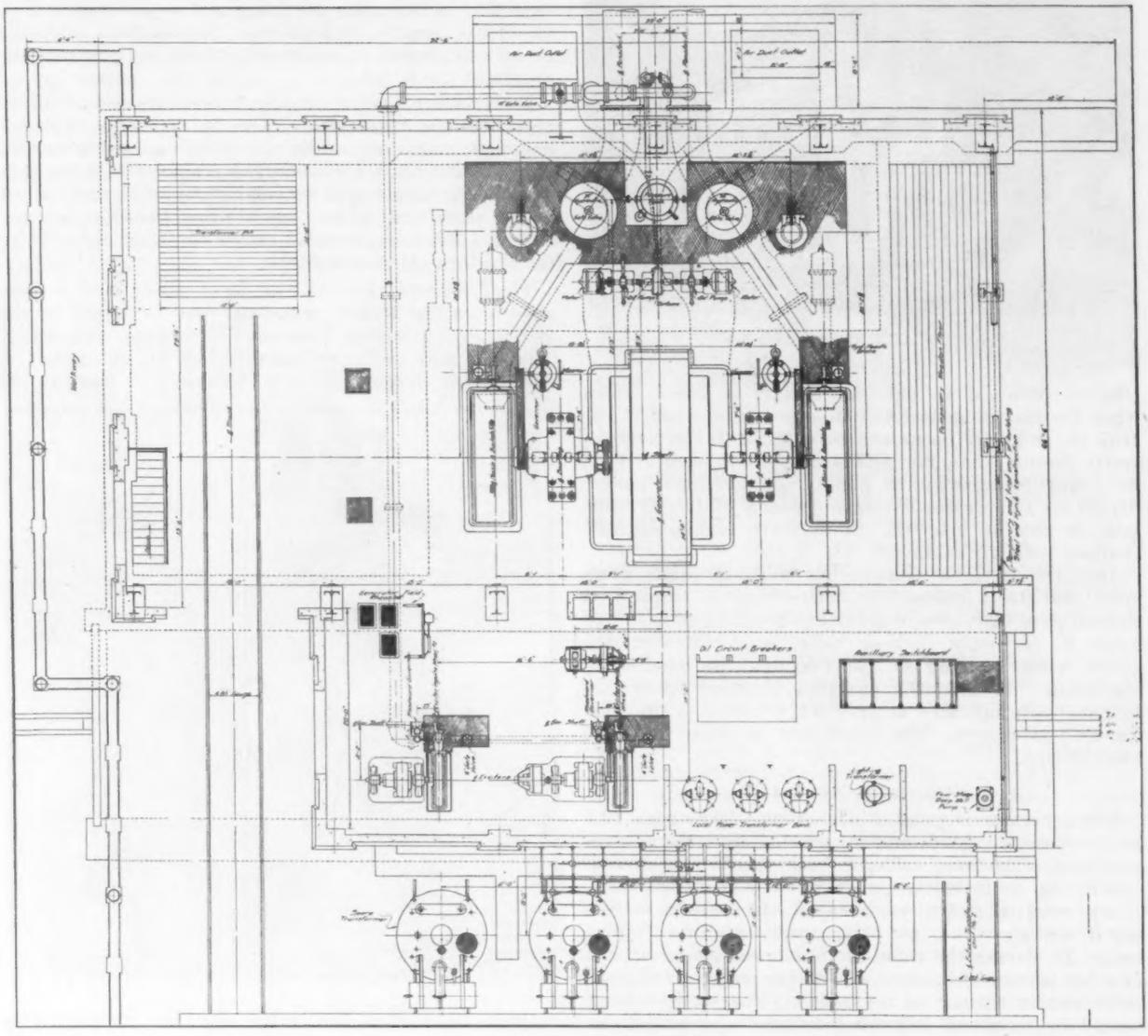
The two 2,000-amp., motor-driven, gang-operated, disconnect-sectionalizing switches in the generator bus are controlled from the switchboard. The control wiring is so interlocked with the two 2,000-amp. generator oil circuit breakers that the disconnecting switches cannot

be operated while the bus is charged. The motor-operated, 3-pole, by-pass disconnecting switch on the local power bank also cannot be operated when the breaker is open.

Three 11,000-kva. 13.2/132-kv. oil-filled water-cooled transformers feed the high-tension bus through a single 6-break oil circuit breaker. Gang operated disconnect switches are arranged so that this breaker may be by-passed and isolated for inspection or repair. Space is provided in the present 132-kv. outdoor bus structure for four outgoing transmission lines and one transformer breaker. The ultimate structure will have a double bus with all breakers in line and space provided for two incoming lines, four transformer breakers, four outgoing lines and one transfer breaker. This structure will occupy a 30 x 400-ft. space and will be built entirely of galvanized structural steel.

Differential relay protection is provided for the generator and main transformer bank. On the 11.5-kv. bus over-current relays are provided for the three local circuits and power-directional relays for transformer protection. Both the main bank and the power bank are equipped with ratio adjusters and capillary-tube thermometers with alarm contacts. The main bank also is equipped with temperature indicating coils.

The control switchboard consists of a 5-panel benchboard supporting instruments and control for the generator, exciters, local power, station power, lighting, 11.5-kv. and 132-kv. lines. Relay and metering equipment is mounted on a vertical board directly behind the benchboard. A 5-panel auxiliary switchboard centralizes the station light and power control and also carries the breakers for the generator field and for the exciters.



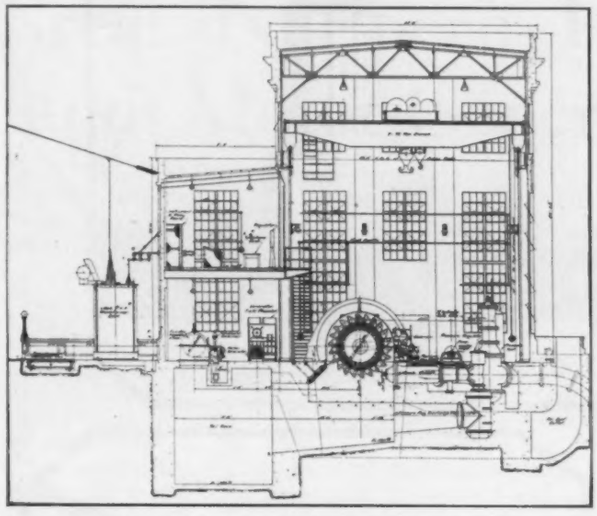
Floor plan Balch power house.

In the basement of the power house is a complete oil treating plant. There are two 3,600-gal. tanks, one for clean and one for dirty transformer oil, and two 200-gal. tanks, one for clean and one for dirty lubricating oil. A very simple system of piping connects all the tanks to a Sharples oil purifying unit and facilitates full flexibility in oil transfer. A piping system and a 20-gal.-per-min. Kinney pump is provided to handle purified oil from the tanks to the transformers, 132-kv. circuit breaker or governor sump tanks.

Cooling water for bearings and transformers is furnished by a 6-in. 300-gal.-per-min. 4-stage motor-driven deep-well pump, which pumps from a sump in the tail race directly to a 10,000-gal. redwood tank. Float switches are provided to start and stop the pump automatically and to give low-water indication. For emergencies a gas-engine-driven 200-gal.-per-min. centrifugal pump is located at a big pool in the river channel upstream from the power house. This pump served during the construction period to furnish water for road maintenance.

Power House Building

The power house is of structural steel with reinforced concrete walls and roof slabs. The roof slab is overlaid with 3-ply asbestos roofing. Steel window sash with ventilators operated by rack-and-pinion operators are provided throughout. All doors are steel except the asbestos door covering cell structures. The initial section of the building is 64 ft. wide, 80 ft. long. Ultimately the building will be 206 ft. long to house four units. The generator room is 40 ft. wide and houses the gate valves, main unit and oil pressure system. On the first floor of the electrical gallery are the exciters, auxiliary switchboard, motor-generator set, station power transformers, 11.5-kv. bus, generator field rheostat, and pump motor. The second floor houses the



Section elevation through generator unit.

main switchboard and the 13.2-kv. breakers and cell structures.

Two 75-ton cranes were selected in preference to a single 150-ton crane because of increased flexibility, lower first cost of crane, and lower building costs incident to reduced overhead clearance and lighter columns and crane beams. They have proved to be very flexible in operation and reduced materially the time of erection of the present installation. Erection was facilitated further by extra floor space in the west end of building obtained by increasing the end-bay length between columns from 15 to 18 ft. The transformer transfer tracks are located in this space.

Due to the location of the power house across the river from the penstock line it was necessary to construct a concrete-lined tail-race parallel to the river and under the opposite side of building. The tail race is excavated from solid rock and has a capacity of 800 sec.ft., the maximum discharge of four units. Dimensions were determined by the elevation of back water from the proposed dam below the plant, loss of head due to eight entering streams from wheel pits, and the requirements of generator ventilation, air for which is taken from above the water in tail race.

Illumination of the building is such that there are no shadows cast on the floor. Eight Holophane mill-type units equipped with 500-watt lamps are suspended from the roof trusses of the generator room and twelve Smyser-Royer wall brackets equipped with Holophane units and 200-watt, 250-volt lamps are mounted around the walls. Suspension-type Holophane units are installed in the switchboard room and switch gallery and ceiling-type Holophane units above the exciters and other auxiliary equipment. An automatic throw-over switch puts half the lighting on the control bus in case of a.c. failure.

Operators' quarters are located at Balch Camp site about two miles distance from the power house as space in the vicinity of the power house was too restricted. Seven cottages and a community garage have been built. Houses are of hollow tile and stucco construction with Spanish tile roofs.

Afterbay Dam

Forebay capacity created by the diversion dam is utilized in taking care of peak loads which require that the water be held back a certain number of hours and then released through the plant. To do this it will be necessary to construct a concrete dam below the plant to maintain constant river flow in spite of plant fluctuations.

This dam will be about 1,650 ft. below the plant and

TABLE I.

Listing of most of the hydraulic electrical equipment used in the Balch plant.

Generator, one, 33,000-kva., 13.2-kv.	General Electric
Generators, two, 125-kw., 250-volt	General Electric
Generator, one, 30-kw., 250-volt	General Electric
Motor-Generator set, one, 30-kw., 250-volt	General Electric
Impulse wheel, one, double-overhung, 40,000-hp.	Allis-Chalmers
Impulse wheel, one, single-overhung, 200-hp.	Allis-Chalmers
Impulse wheel, one, single-overhung, 250-hp.	Allis-Chalmers
Governors, two, for 40,000-hp.	Allis-Chalmers
Governors, two, for small wheels	Woodward
Governor oil-pressure system	Allis-Chalmers
Oil circuit breakers, two, 2,000-amp., 15-kv.	General Electric
Oil Circuit breaker, one, 500-amp., 15-kv.	General Electric
Oil circuit breakers, two, 600-amp., 15-kv.	General Electric
Oil circuit breaker, one, 400-amp., 132-kv.	Kelman
Oil pump, one, transil oil handling	Kinney
Disconnect switches, two, 2,000-amp., 15-kv., motor-operated	Elpeco
Disconnect switch, one, 500-amp., 15-kv., motor-operated	Elpeco
Disconnect switches, two, 400-amp., 132-kv., 1-break	Delta-Star
Disconnect switch, one, 400-amp., 132-kv., 2-break	Delta-Star
Disconnect switches, three, SPST, 15-kv.	General Electric
Ground switch, one, 132-kv.	S.J.L. & F. Corp.
Transformers, four, 11,000-kva., 13.2/132-kv.	General Electric
Transformers, four, 1,000-kva., 13.2/11.5-kva.	General Electric
Transformers, three, 150-kva., 11,500/440-volt	General Electric
Transformer, one, 37.5-kva., 11,500/230-115-volt	General Electric
Transformers, potential and current	General Electric
Sluice gates, two, 30-in.	Water Wks. Supply
Trash racks	Pac. Rolling Mill
Gate, intake by-pass, one, 24-in.	Rensslaer Valve Co.
Bulkheads, two, 72-in. steel, for adits	Western Pipe & Steel
Valve, sand trap sluice, one, 24-in.	Chapman
Penstock pipe	Ferrum Company
Penstock manifold and sand trap sluice pipe	Steel Tank & Pipe Co.
Penstock pipe and fittings, for exciter	Crane
Venturi meters and recorders	Simplex Water Wks. Sup.
Water-level indicator and long-dist. recorder	Stevens
Valve, butterfly, one, 60-in., motor-operated	Pelton
Valves, air, three sets, 6-in.	Simplex Water Wks. Sup.
Valves, gate, two, 32-in., 1,500-lb. working pressure	Joshua Hendy
Valves, gate, one, 10-in., 1,500-lb. working pressure	Joshua Hendy
Valves, gate, two, 6-in., 1,500-lb. workng pressure	Crane
Pressure gages, indicating and recording	Foxboro
Switchboards, three, 5-panel	General Electric
Bus supports, 25-kv.	Elpeco
Insulators, post-type, 132-kv.	Champion
Lightning arrester, 15-kv.	General Electric
Choke coils, 15-kv.	General Electric
Pump, one, 4-stage, 300-g.p.m., deep-well	Byron Jackson
Pump, one, 2-in., 200-g.p.m., centrifugal	Cal. Hyd. Eng. & Sup. Co.
Pumps, two, 2-in., 2 x 8 sewage	Byron Jackson
Cranes, two, 75-ton, 4-motor, with 10-ton aux.	Cyclops
Structural steel, for power house building	Minneapolis St. & Mach.
Structural steel, for 132-kv. bus structure	Pac. Coast Steel
Window sash, steel, and operators	Detroit St. Prod. Co.
Doors, steel, swinging	Truscon
Door, steel, rolling	J. G. Wilson Corp.
Ventilator, for operating room	Aeolus Dickenson Co.
Partitions, steel sash	Truscon
Roofing, 3-ply asbestos	Johns-Manville

will be built in two stages. The initial height of 66 ft. above river bed will develop a pondage of 104 acre-ft. net. With an ultimate height of 115 ft. the net capacity will be 375 acre-ft. Needle-type control gates operated from the power house will regulate normal river flow. Spillway and spill-crest gates will be installed when the dam is raised to ultimate height. Water level recorders will be installed at both the forebay and afterbay with long-distance water-level indicators in the power house.

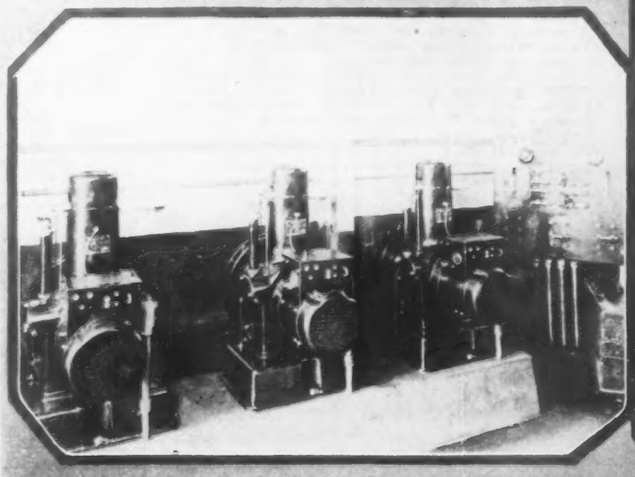
The 364 ft. of 12 x 12-ft. unlined pressure tunnel and adit that have been driven to by-pass the river during the construction of the afterbay dam will serve ultimately as the upstream end of the power tunnel for the power house to be located later about two miles below the Balch plant.

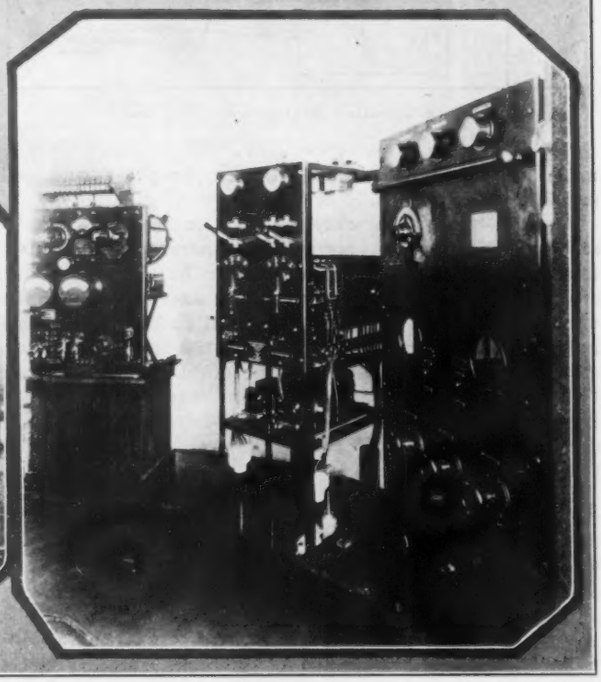
Estimated cost of the first unit of the Balch plant exclusive of the afterbay dam was $3,764,000 and the actual cost was well within the estimate. Before construction was commenced $569,000 had been expended for pioneering, surveys and hydrography and $1,200,000 for the project roads and bridges.

The project was designed and constructed by the construction department of the San Joaquin Light & Power Corporation, with Harold K. Fox in charge as superintendent of construction; L. L. Ellis, assistant superintendent of construction; R. L. Bryant, resident engineer; J. W. Jourdan, designing engineer; C. P. Rhine, electrical engineer; J. D. McDougald, general foreman; A. M. Smith, superintendent of supplies; and W. R. Couse, chief accountant.

Farm-Lighting Units Supply Lighthouse Power

THE San Pedro breakwater lighthouse, at the end of the breakwater that forms the outer Los Angeles harbor, is using small engine-driven, farm-type light-and-power plants to supply power for the operation of automatic radio fog-signal service. This radio signal service is entirely automatic in operation and transmits signals at a particular frequency and a known period which enables ships in the surrounding waters to get their bearings. At the right is shown an exterior view of the lighthouse; the aerial may be seen swung from the tower. Below is shown the installation of Westinghouse light-and-power units and control panels. The radio signalling apparatus and control also may be noted.





One of the new 25-cycle motor-generator locomotives on the Cascade Division of the Great Northern Railway

Great Northern Using A.C. Trolley and Motor-Generator Locomotives

ELECTRIFICATION now under way on the Great Northern Railway has attracted attention among railway officials and electrical engineers because of the new system adopted and because of the retirement of one of the pioneer railroad electrifications in America, a 3-phase system, to give place to the new work. The present undertaking involves revision of the original electrification and extension of the electrification westward to Skykomish, Wash. The electrified mileage thus will be increased from the original four miles between Tye, Wash., and the eastern portal of the Cascade tunnel to 24 miles of main-line trackage, exclusive of yards, from Skykomish to the east end of the Cascade tunnel. This project constitutes the first step in a program that is planned to be pursued consistently until the 96 miles of main line, via a new tunnel, from Gold Bar to Wenatchee is completely electrified.

Involved in present construction are: a 110-kv., 3-phase, 60-cycle transmission line from the Beverly substation of the Puget Sound Power & Light Company to Skykomish; the erection of new outdoor substations at Scenic and Cascade; a 13.2-kv., 7,500-kva. frequency-changer set in the Skykomish station where connection is made with the 3-phase, 110-kv. transmission line of the power company; and the 44-kv., single-phase, 25-cycle railway transmission line from Skokomish to Tumwater. Later and as required a second 44-kv. railroad transmission line will be added to the railroad pole line, a second frequency changer installed at Skykomish and still another frequency changer installed at either Tumwater or Wenatchee. Special features of design of the frequency changers include the use of automatic voltage regulators to take care of power reversals during periods of regenerative braking; motor-operated stator shifters to care for phase-shift conditions incident to the fact that two widely separated 110-kv. transmission lines of the Puget Sound Power & Light Company will be tied together through the machines; and spring mounting of the stators to reduce vibration of the single-phase machines.

The 44-kv. lines, the 11.5-kv. trolley contact line and a signal line all will be carried on a single-pole line along the right-of-way. The trolley line is No. 4/0 cadmium bronze supported by an inclined catenary. Construction of the railroad company's lines and substations is being done by Stone & Webster under contract.

Original Installation is Modified

The original electrification, which now is undergoing modification, was installed through the Cascade tunnel in 1909 mainly for the purpose of eliminating gas and smoke to expedite train movement. That electrification extended from Tye at the west portal to Cascade Tunnel station at the eastern portal and comprised four miles of main-line track and four miles of yard track. The tunnel itself is 2.75 miles long and constructed on a 1.7 per cent grade. A 6.6-kv., 3-phase, 25-cycle system was used with a double overhead catenary trolley. This original electrification itself undoubtedly has served the purpose for which it was installed and brought relief from an intolerable condition that existed under steam operation. However, because of its special requirements of organization and operation the original electric service has been tolerated under extremely high operating costs.

When the original installation was made there was no electric power supply within available distance from which power could be obtained. That condition necessitated the erection of a hydroelectric generating station at Tumwater on the Wenatchee River about 30 miles from the tunnel. Power produced there by three 2,000-kw., 3-phase, 25-cycle, 6.6-kv. units was transmitted at 33-kv. to the substation at Cascade Tunnel. Water was

brought to the plant in an 8½-ft. flume 2½ miles long providing an operating head of 176 ft.

Experience both favorable and unfavorable gained from the early electrification was most helpful in selecting the new 11-kv., 25-cycle, single-phase system utilizing conversion to d.c. aboard the locomotives. Some of the reasons for the use of 25 cycles on the new system as against the standard commercial frequency of 60 cycles are:

1. Facilitates use of full capacity of 6,000-kw., 25-cycle output of the present Tumwater plant. Liberal design of the 3-phase machines at Tumwater makes possible full nameplate capacity at single-phase.
2. Standard frequency for railway transformers and much other equipment already developed is 25 cycles.
3. Less interference with communication circuits is experienced at 25 cycles.
4. Regulation of a 25-cycle system is considerably better on fluctuating loads and losses are less than on a 60-cycle system.
5. Copper ground return would have been required for a 60-cycle system because of higher impedance of railreturn circuit.

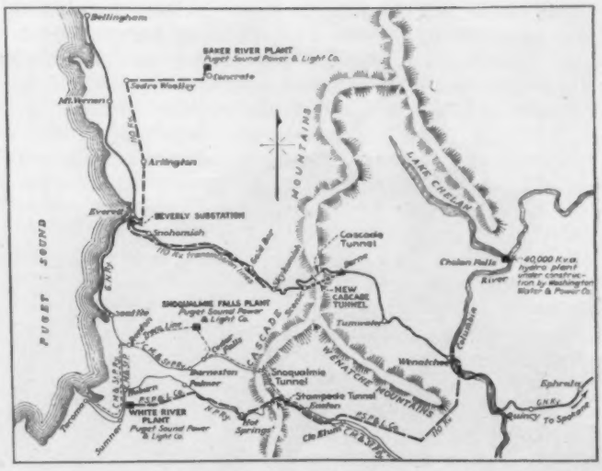
To secure the advantages of both a.c. transmission and trolley and d.c. traction motors the motor-generator type of locomotive is used. Through the use of this type of locomotive it is possible to take advantage of the inherent merits of both the a.c. and the d.c. systems. This means high-voltage transmission of power to the locomotives with minimum copper investment and power loss; static, unattended transformer stations along the railway line; light overhead construction; and the great advantages of d.c. traction motors. The system provides practically unlimited flexibility of control in operation and regeneration.

With the easy limitations contemplated in the power supply for the new electrification and the great flexibility of the motor-generator type of unit it will be possible always to operate anywhere within a speed range limited only by the continuous rating of a locomotive. Furthermore, the method of accelerating a train by means of voltage control of the motor is ideal from the standpoint of economy both in starting losses and in power demand upon supply sources. By using a synchronous motor to drive the motor-generator set on the locomotive complete local power-factor regulation is obtained.

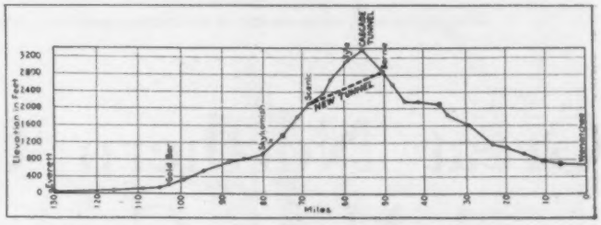
The motor-generator sets consist of a 2,100-hp., 1.2-kv., single-phase synchronous motor driving a 1,500-kw., 600-volt d.c. generator. An exciter mounted on one end of the unit shaft supplies excitation for both machines and a similar exciter mounted on the other end of the unit shaft supplies the traction motor fields for use during regenerative braking.

For regenerative braking the same flexibility of control is available as in motoring. It is possible to regenerate at all speeds within the established range of the locomotive down to practically a standstill. The varied train weights over this section and the conformation of the country make this wide range an effective feature, as the speed while regenerating can be adjusted to suit the grade of any particular section.

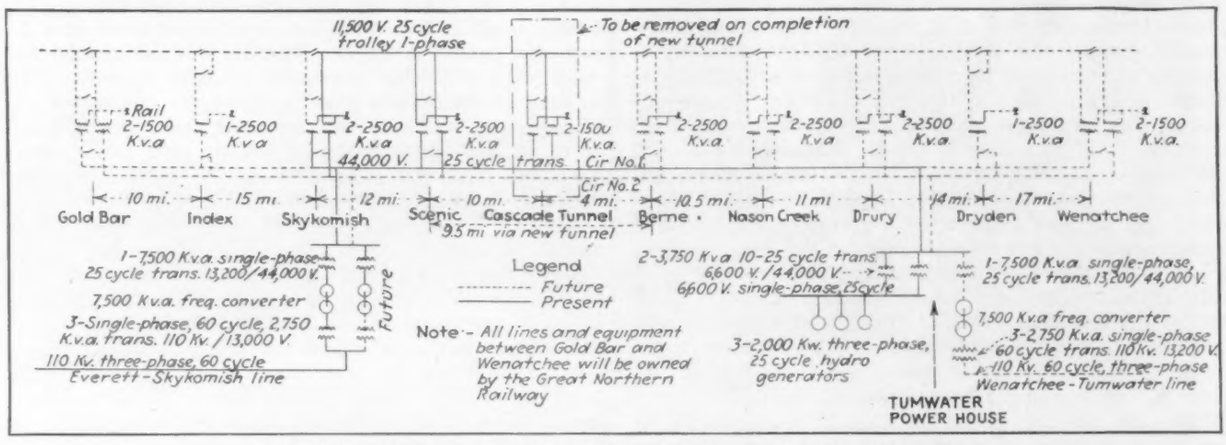
Initial locomotive equipment consists of two Westinghouse and two General Electric locomotives. The two Baldwin-Westinghouse electric locomotives each consist of two cabs mechanically and electrically iden-



Map showing relation of various factors involved in the Cascade electrification.



Profile of grades encountered by Great Northern in crossing Cascades.



Schematic wiring diagram of transmission, substation and trolley-contact system.

tical. Each one of these cab units is self-contained and fully equipped to operate alone although present plans are to operate two cabs together as a road locomotive. Each locomotive weighs about 357-5 tons, is 94-ft. 4-in. long and has a continuous rating of 88,500 lb. tractive effort at 15.5 m.p.h. Maximum allowable speed is 37.5 m.p.h and maximum rating is about 7,000 hp. The two General Electric locomotives are the single-cab type, each rated at 54,000 lb. continuous tractive effort at 16.5 m.p.h

Careful consideration has been given to possible interference to signal and communication lines due to the single-phase system. Telegraph and telephone lines enroute will undergo general revamping, using cables or removing lines entirely from the right-of-way when and where necessary. Local telephone lines heretofore adjacent to the right-of-way will be removed to a convenient distance therefrom to avoid inductive troubles. Distance has been selected as the most effective remedy for the solution of the problem of inductive interference.

Puget Sound to Supply Power

Contracts have been entered into with the Puget Sound Power & Light Company to supply the Great Northern with all power for the electrification. Under the contract agreement the Tumwater generating plant will be operated by the power company and tied in with its system through a 44-kv. railway transmission line at present, and later possibly through the 110-kv. transmission line between the White River plant and Wenatchee.

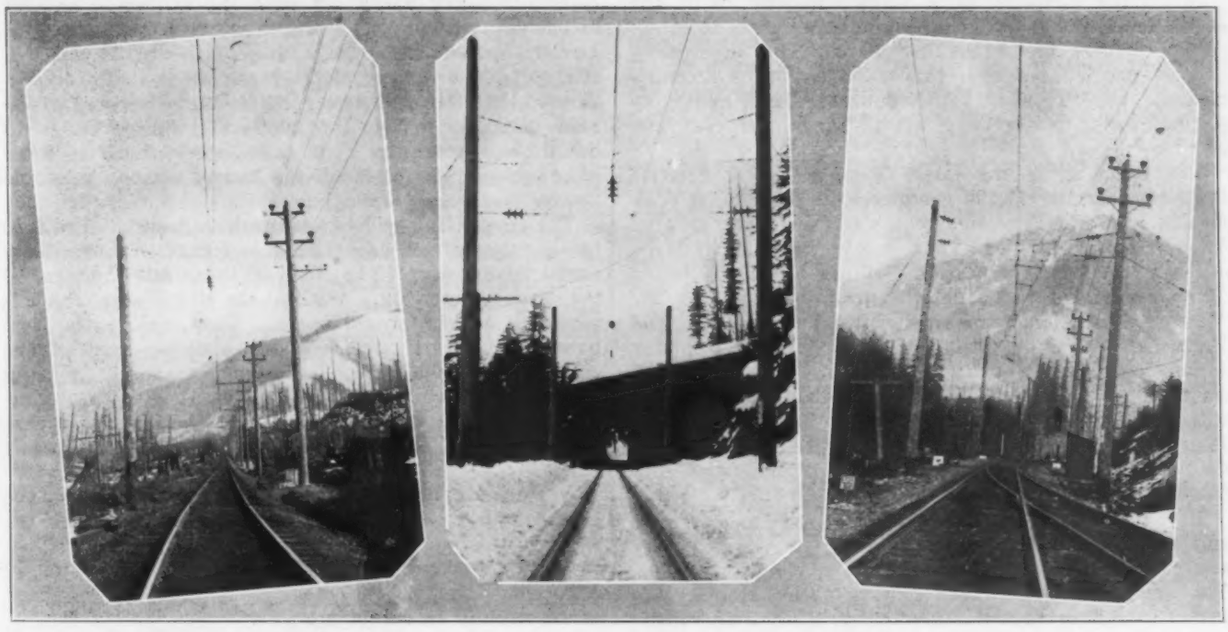
Metering presented some interesting problems to the power company owing to the condition of the contract which calls for the simultaneous measurement of demand at two widely separated points. In addition, it is necessary to take into account power fed back into the power company's system by the Tumwater plant and by the electric locomotives when regenerating. Power will be measured by two 3-phase ratchet meters at each point and demands will be measured by graphic meters to obtain simultaneous records at the two points.

According to contract agreement the billing for power will be made upon the basis of the average of the three highest 5-min. demands occurring during the month. In the event of power failure any peaks resulting during the first 15 min. after service is restored are to be ignored. As all power taken by the railway company from the 110-kv. line of the power company will pass first through frequency changers driven by synchronous motors it will be possible to maintain unity power factor or even a leading power factor if desired.

The main line of the Great Northern extends from St. Paul, Minn., to Puget Sound and has the lowest ruling grade through to the Pacific Coast of any of our Western railroads. Heaviest and most severe grades against load movement are encountered in crossing the Cascade Mountains in Washington where the line is single track. There the rise to the summit on both sides is precipitous and on the western slope a circuitous route is required to make the ascent. Many snowsheds are required to shelter this section of the line from the deep snow and slides during the winter season. Total snowfall at Cascade Tunnel runs as high as 670 in., or nearly 56 ft. per season. Under such a condition it is obvious that it is difficult and expensive to keep tracks open in the higher elevations. The necessity for additional snowsheds and extensive repairs to existing sheds on the present route brought needed expenditures to a point where a new line at a lower level would show a substantial gain.

Comparison of Operating Characteristics

Between Seattle and Skykomish, as shown in the accompanying profile, the grades are not unduly heavy nor are the curvatures excessive. Heavy grades and curves are confined to that section of the western slope of the Cascade Mountains between Skykomish and Cascade Tunnel and on the east slope the railway is not especially concerned at present. Contemplated changes in line and certain other reasons have combined to delay electrification on the eastern side. On the western slope a continuous grade of 2.2 per cent with curvatures up to 10 deg. are encountered in the 21.4 miles from Skykomish to Tye. Through the 2.75-mile present Cascade



Typical inclined catenary 11.5-kv. trolley construction on Great Northern electrification. At left, a tangent section also showing two 44-kv. single-phase transmission lines and signal circuit. At center, an air gap between trolley sections. At right, a curve and turn-out section. This work was done by Stone & Webster, Inc.

Tunnel the prevailing grade is 1.7 per cent. A new tunnel through the Cascade Mountains is under construction and when completed will be the longest railway tunnel yet built in America. The new tunnel will be 7.79 miles long, 16 ft. wide, and 20 ft. 10 in. in the clear above rail tops. It will reduce the total climb 500 ft., shorten track mileage by 7.68 miles and eliminate the equivalent of nearly six complete circles of curvature. Electric power is being utilized in all branches of this tunnel construction job which is scheduled for completion in 1928.

Under steam operation a 2,500-ton freight consisting of about 60 cars covers the 80 miles from Seattle to Skykomish in approximately 5½ hours when hauled by a 250-ton Mikado type 2-8-2 oil-burning locomotive having a normal tractive effort of 64,300 lb. At Skykomish, prior to extended electrification, two 260-ton 2-6 + 8-0 Mallet-type locomotives each developing a tractive effort of 78,300 lb., were cut into the train at uniform spacing to assist on the 2.2 per cent grade to Tye. Including delays of one hour at Skykomish for this operation and 20 min. for water at Scenic the 21.4 miles to Tye was covered in 4½ hours. Upon arrival at Tye the steam helpers were replaced by 25-cycle a.c. electric locomotives arranged two ahead and two in the center of the train, after which the run from Tye to Cascade Tunnel station was made in 22 min. Allowing 15 min. at Cascade Tunnel for cutting out the electrics and inspecting air brakes the train when reassembled covered the remaining 53 miles to Wenatchee in 4 hours.

Saving Effected by Electrification

By eliminating the duplication and delays of helper service and other losses of time incident to steam operation such as watering, refueling and standby losses the present electrification project is calculated to effect material savings in operating costs. In addition it will permit faster train movement over the section involved and virtually will fulfill in every respect the requirements of present operating conditions. Consideration has been given to future requirements by provision of ample allowance for expansion.

Completion of the first 24-mile section from Skykomish to Cascade Tunnel will represent an expenditure of $1,750,000, including two of the four locomotives. The second pair of electric locomotives and extension of electrification through the two remaining road sections between Gold Bar and Wenatchee will cost another $1,250,000. Savings in operating costs are expected to bring a return of 15 per cent on the entire $3,000,000.

What Price Public Utility Advertising?

A Summary of What it Costs the Coast Valleys Gas & Electric Company Per Year to Carry on Its Advertising and Publicity

RIGHTLY considered, the term advertising may or may not be construed to include all the items which have been placed under that general classification here. Advertising is a broad term. It covers a multitude of sins. And whereas some activities remotely connected with advertising may not, technically speaking, be classified as advertising in the segregation of the accounts of a large company, with the smaller company it is convenient in many cases to group such activities under the one head. The advertising experts may quarrel over this classification of accounts if they like. It shall be the purpose here merely to consider what advertising of all kinds has cost one small company.

The company is the Coast Valleys Gas & Electric Company, serving 17,195 customers in the Salinas Valley and Monterey Peninsula region in California, an area of some 1,250 sq. miles. There are no particularly large cities in the territory served. Salinas has a population of approximately 7,000 and the group of towns on the Monterey peninsula consisting of Monterey, Carmel and Pacific Grove have about 15,000 people. The company serves, besides these cities, the towns and rural communities of Blanco, Castroville, Chualar, Coburn, Gonzales, Greenfield, King City, Moss Landing, Pebble Beach, San Ardo, San Lucas, Santa Rita, Seaside, Soledad and Spreckels, and the farming communities contingent to them.

In Salinas the company serves electric energy, gas and water; in Monterey and Pacific Grove electricity and gas, and in the remaining territory electricity alone. The company during 1926 had not been actively engaged in selling electrical appliances other than ranges and water heaters. It is planned, however—and in fact the building now is in preparation—to establish during 1927 a merchandising department whose activities, no doubt, will materially alter the advertising plans found adequate under conditions in 1926 and previously.

Making the Budget

In determining the budget for advertising for the year 1926 the records of past years' expenditures were referred to and correlated with the estimated amount of business anticipated during 1926 both in the way of new business to be added and securities to be sold. A study of these figures revealed certain general percentages in the relation between expenditures devoted to various purposes. With this alone to guide it and with but little information as to the appropriations of other companies similarly placed, the budget was made out as shown in the accompanying table.

The advertising will be seen to have been divided into two groups, direct advertising and publicity or educational advertising. The first of these might be called the true advertising. With these items even the advertising experts would agree. They include the local newspaper advertising, receiving 50.9 per cent of the entire advertising appropriation; poster boards, getting 6.7 per cent, and the miscellaneous other forms of direct advertising, 14 per cent. A total of 71.6 per cent of the entire appropriation was scheduled for this purpose.

A glance at the actual expenditures as against the budget will be interesting. It will be seen that the expenditures come somewhat within the margin set forth. Newspaper advertising still maintained its 50 per cent standing, the other two items having been pared slightly in actual practice.

Under the general heading of publicity and educational expenditures the first item is that labeled "parti-

cipation in national and co-operative publicity." This covers such items as contributions to the Public Policy advertising fund of the N.E.L.A., Gas Appliance Week, employees' home lighting contests, Society for Electrical Development and California Electrical Bureau, together with the purchase and distribution of reprints of N.E.L.A. publications. This item will be seen as a very small part of the entire budget and a still smaller proportion of the actual expenditures.

The second item, "contributions to local celebrations and booster organizations," represents the money paid in contributions to the local annual rodeo, a nationally known event, the California Development Association,

Advertising Budget and Expenditures, Coast Valleys Gas & Electric Company

	1926 Budget		1926 Expenditures	
Local newspapers	$ 4,546	50.9%	$ 3,881	50.1%
Bill boards	600	6.7%	308	4.0%
Miscellaneous	1,251	14.0%	990	12.9%
Total direct advertising	$ 6,397	71.6%	$ 5,188	67.0%
Participation in national and co-operative publicity	$ 851	9.5%	$ 689	8.9%
Contributions to local celebrations and booster organ.	960	10.8%	1,361	17.6%
Community welfare organizations	95	1.1%	169	2.2%
Magazines and books of general circulation	360	4.1%	333	4.3%
Total publicity and educational	$ 2,266	25.5%	$ 2,552	33.0%
Unforeseen	$ 250	2.9%		
Total budget	$ 8,913	100 %	$ 7,740	100 %
Cost per dollar of revenue		7.23 mills		
Gross revenue		$1,233,000		
Addition to budget	$ 2,500	29.0%	$ 2,347	30.4%
Total	$11,413	129 %	$10,087	130 %

local chambers of commerce, and to other local events of a booster nature throughout the year. This item overstepped the budget's good intentions only slightly.

In commenting on the item, "community welfare organizations," before the Advertising-Publicity Section, Pacific Coast Electrical Association, James F. Pollard, vice-president and general manager of the company, stated good naturedly, "This item shows that the manager's head is as soft as his heart," giong on to say that the money was spent as contributions to numerous welfare organizations, such as Y.M.C.A., Salvation Army, Santa Barbara earthquare relief, etc., in the interest of public relations. In spite of his remark it will be seen that this item, although overstepping the budget slightly, was kept very well in check.

Advertising in school annuals and like publications, an item which has very properly been taken out of the direct advertising class and placed under general public relations expenditures, was also held well within reason.

The total for the second group of advertising expenditures, those of a general educational and good will nature, was increased somewhat over budget specifications. The total spent grew from 25.5 per cent of the entire budget to 33 per cent of the entire expenditure. However, the contingency fund, labeled "unforeseen," was ample to take care of the increase over the budget and to leave the balance well within the original budget.

Cost Per Dollar of Revenue

On the basis of the original budget and the subsequent expenditures made according to that budget, the total cost of advertising and publicity for the company amounted to 7.23 mills per dollar of revenue. The gross revenue for the year was $1,233,000.

At the time the budget was made up, an intensive institutional advertising campaign later undertaken had not yet been decided upon and so was not provided for in the budget. The cost to Coast Valleys Gas & Electric Company of this campaign was estimated at the time of its institution at $2,500 and will be seen added to the budget in the accompanying table. This new advertising program increased the budget by 29 per cent and the actual expenditures by 30.4 per cent. The addition also raises the total ultimate cost of advertising per dollar of revenue to 8.2 mills.

When it is considered that the ordinary commercial business expends an average of from 2 to 5 cents per dollar of gross revenue in advertising, it will be seen that the entire program of this utility company for its electric, gas and water service was indeed a most modest one. Taking into consideration that a large proportion of even these costs were for expenditures of a public relations nature and not strictly to be classed as pure advertising the figures are surprisingly low for the value returned.

The Salinas Water Tower

Salinas has a new water tower. The passerby has no opportunity to neglect seeing it. By day it bears the attractive emblem of the Coast Valleys Gas & Electric Company and by night this emblem is illuminated. The story of the water tower is in itself a story of good advertising and better public relations. Though it bears no financial relation to the account of the company's advertising budget it does have a bearing upon the value of good public relations on the furthering of mouth-to-mouth advertising.

In serving the city of Salinas with water the company was faced with the need of a new and larger water tower in order to maintain pressure and to provide storage for emergency. The logical site for the location of the new tower, from an engineering standpoint, found itself in the better residential district of the city. But when permission was asked of the city council to locate the tower in the heart of the residential district protests arose on every side. Mr. Pollard, in his application for permission, promised to erect as well designed a tower as was obtainable, keep it well painted and in good condition and likewise promised to make a park out of the city block upon which it would be located.

Despite these promises petitions were circulated and mass meetings called to protest against the placing of the tower in the residential district. It was difficult for the property owner to visualize anything but an ugly structure and to imagine all sorts of calamities, such as lowered value of adjoining property, a migration of better homes away from the district and other fears of like nature.

As the tower went up the dissatisfaction continued to be voiced. When the tower was finished dissatisfaction gave way to discouraged bafflement. When the tower was neatly painted in gray, interest in Mr. Pollard's promise revived.

When the neighborhood surrounding the water tower awoke to the realization that it really was to be given a beautiful park all antagonism turned to enthusiasm. The most rabid objectors were the first to seek out the company and to compliment it upon its fine public spirit and its integrity to a promise.

The water tower park has become, not a detriment to the community and something to bring down property values, but the pride of the community and an agency to advance values in its vicinity. The newspapers of the city, sensing this reversal of sentiment, carried the compliment voiced by many individuals into its editorial columns in praise of the public utility company.

And the water tower stands today as a monument to the advertising value of sound public relationships.

Engineering Practice

Underground Construction for Service to Large Buildings

Two Largest San Francisco Buildings so Located That Two Feeders Provide Duplicate Service for Both

UNDERGROUND construction required by two of San Francisco's largest office buildings involves some interesting features. The largest of these two, the Russ Building, has 30 stories of office space. Connected load for this building calls for:

1,050 hp. at 480 volts, 3-phase.
500 hp. at 240 volts, 3-phase.
1,172 kw. at 120/240 volts, single-phase.

The entire power demand of this building, totaling more than 2,300 kw., is to be supplied by alternating current.

The second of these two buildings, the Hunter-Dulin Building, has 22 floors of office space with connected load of:

480 hp. at 480 volts, 3-phase.
300 hp. at 240 volts, 3-phase.
800 kw. at 120/240 volts, single-phase.
200 hp. at 240 volts, d. c.
60 kw. d.c. emergency light.

From this listing it may be seen that both a.c. and d.c. power are to be used in the Hunter-Dulin Building to supply its 1,600-kw. connected load.

Primary Supply

Alternating-current power supply for these two buildings is to be supplied through 3-phase, 4.1-kv. primary feeders. It so happens that the geographical location of these two buildings is approximately half-way between two of the down-town distributing substations. This facilitates the duplication of supply required for continuity of service to this important load. Reference to Fig. 1 will give an idea of the physical arrangement involved. It is planned that normal supply for the Hunter-Dulin Building will be from the Station C feeder, utilizing the Station J feeder for standby service. Normal supply to the Russ Building will be from the Station J feeder using the Station C feeder as standby. Thus the normal load as well as the likelihood of emergency load is divided between these two stations.

Primary underground leads will be 500,000 circ-mil. 3-conductor, paper-insulated, lead-covered cables. The long cable runs from the stations will be terminated at junction boxes just outside of the buildings so that the short cable lengths entering the building vault may be killed if necessary. Actual physical dimensions of the 3-phase primary cable utilized on this job were determined by the existing installation of 3-in. tile duct line, which size has been used in a large part of the underground duct system in the lower section of the City of San Francisco.

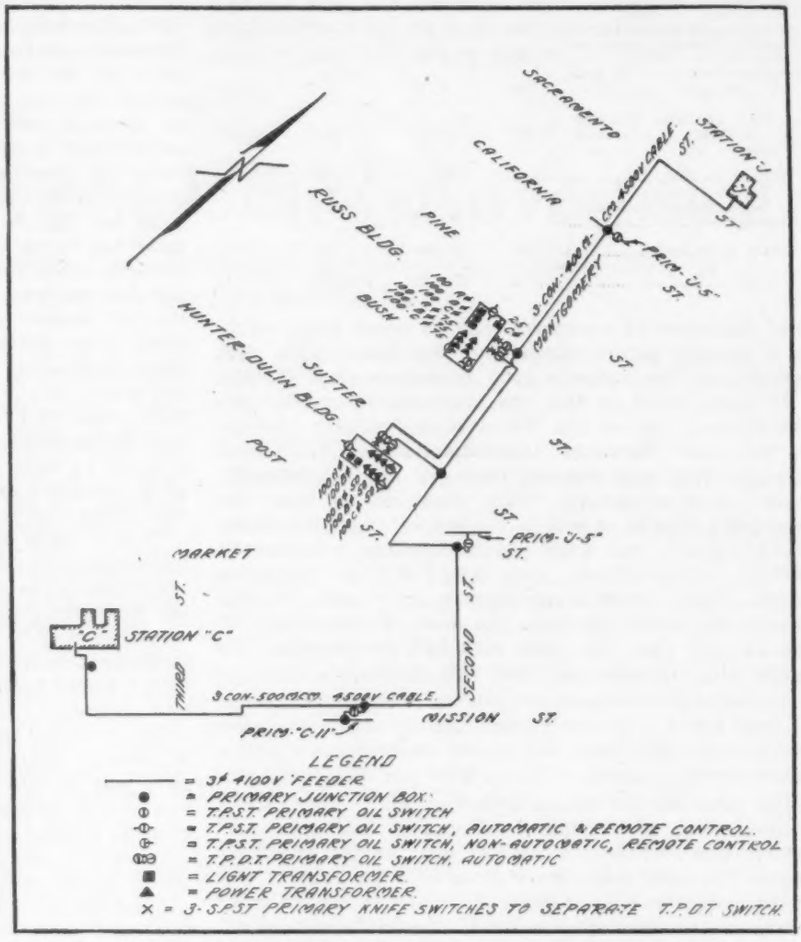


Fig. 1. One 4.1-kv. 3-phase feeder from each of two distribution stations arranged to give double service to two important office buildings.

Manhole Construction and Equipment

At each of the two buildings transformer vaults have been constructed in the sidewalk space and built large enough to house all of the power-supply equipment involved. Each of the two vaults was designed of ample capacity to facilitate construction and maintenance, as well as to provide for transformer cooling. The vault for the Hunter-Dulin Building is 50 ft. long, 8 ft. wide and 13 ft. high, while the Russ Building vault is 26 ft. long, 13 ft. wide and 14 ft. high. Air shafts have been constructed at one end of each of the vaults to permit an influx of cool air. Air circulation in the vault will be by normal convection currents, warm air will find its way from the vault through the perforated metal doors in the sidewalk at the main entrance of the vaults. These sidewalk doors provide the only entrance into the vaults. Concrete con-

struction was utilized throughout in these vaults and the standards as laid down by the national code were followed.

For the Russ Building the installation includes three 100-kva. transformers connected Y-delta for the 480-volt, 3-phase power, three 100-kva. transformers, one for each phase of the supply, for the single phase 120/240-volt lighting service, and three 75-kva. transformers connected Y-delta for the 480-volt power service. In addition there is a 25-kva. transformer connected to one of the primary phases to serve emergency lighting.

The installation for the Hunter-Dulin Building consists of two 100-kva. transformers connected single phase to two of the phases of the 4.1-kv. primary circuit to supply the lighting load, three 100-kva. transformers connected Y-delta for the 480-volt, 3-phase power and three 50-kva. transformers connected Y-delta for the 3-phase, 240-volt power. All of the transformers installed in these vaults are of the outdoor type.

The double service that is run to each of the buildings is capitalized upon fully by the installation of an automatic throw-over switch at each installation. The control of this automatic switch is so connected that should the service fail on the normal or preferred feeder the switch will operate instantly to throw the building load over onto the emergency feeder, resulting in no service interruption whatsoever to the building itself. A further feature of this automatic throw-over switch is that upon re-energization of the preferred feeder the switch at once transfers the building load from the emergency feeder to the normal or preferred feeder and, again, does it so quickly that there is no interruption to service for the building. Disconnecting switches are installed on each side of the automatic throw-over switch connecting directly to the 4.1-kv. bus structure so that either side of the throw-over switch may be disconnected from the bus. With this arrangement it is possible to isolate completely that portion of the throw-over switch by utilizing the disconnecting switches and by removing the disconnecting links from the outside cable junction box. Each of the individual transformer banks also is protected by a remote-control, automatic-overload-trip oil switch with the exception of the elevator bank which, according to requirements, has a remote-control non-automatic switch.

All of the oil switches are mounted on panels which were assembled at the shop and subsequently taken to the job. Current transformers for trip coils are located on the switch panels, on the load-side of the switch. Extra heavy rubber-covered wire pulled in conduit serves as the connecting link between the 4.1-kv. buses and the high side of the transformer banks. Cutouts are installed only on the elevator transformer banks. Current and potential transformers for the metering equipment are mounted on a rigid frame assembled in the shop, thus saving considerable time in installation. The unit type of construction was used to good advantage.

Metering Equipment

Four watthour meters will measure the power supplied to the Russ Building. A 3-element meter will be used to register the lighting load because the transformers for this lighting load are connected single phase, one on each phase of the 4.1-kv. circuit. Demand meters will be arranged to register the demand of each individual meter and also there will be a demand meter that will register the entire demand of the building.

For the Hunter-Dulin Building the metering equipment will consist of three a.c. and two d.c. watthour meters, one demand meter on the 480-volt elevator service and one demand meter for the two d.c. meters. One polyphase meter will be used on the lighting service and another polyphase meter for the general power service.

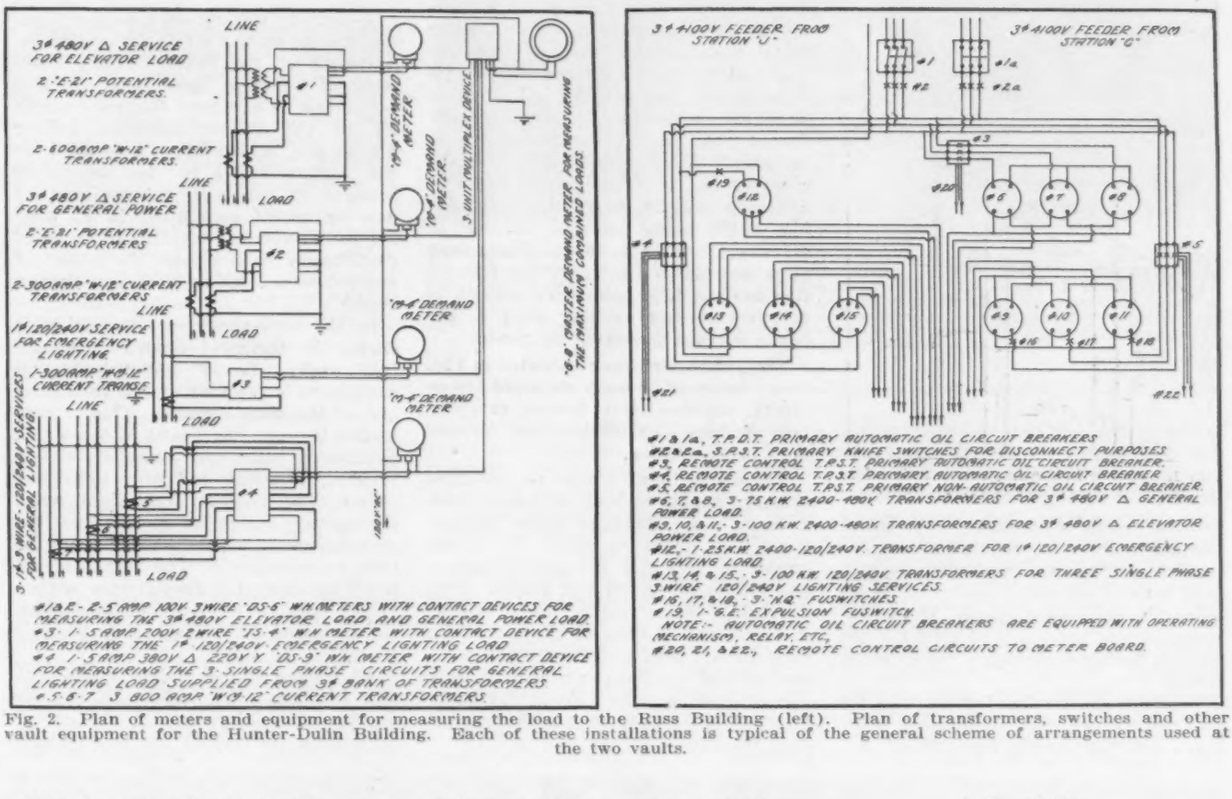

LINE
3φ 480V Δ SERVICE FOR ELEVATOR LOAD
2-"E-21" POTENTIAL TRANSFORMERS.
2-600 AMP "W-12" CURRENT TRANSFORMERS.
3φ 480V Δ SERVICE FOR GENERAL POWER
2-"E-21" POTENTIAL TRANSFORMERS
2-300 AMP "W-12" CURRENT TRANSFORMERS
1φ 120/240V SERVICE FOR EMERGENCY LIGHTING
1-300 AMP "W-12" CURRENT TRANS'R.
3-3φ 3 WIRE 120/240V SERVICES FOR GENERAL LIGHTING
LOAD
#1
#2
#3
#4
"13-A" DEMAND METER
"13-B" DEMAND METER
"13-C" DEMAND METER
"13-D" DEMAND METER
3 UNIT MULTIPLEX DEVICE
"13-D" MASTER DEMAND METER FOR MEASURING THE MAXIMUM COMBINED LOADS.
#1 & 2 - 2-5 AMP 100V 3 WIRE "DS-6" WH METERS WITH CONTACT DEVICES FOR MEASURING THE 3φ 480V ELEVATOR LOAD AND GENERAL POWER LOAD.
#3 - 1-5 AMP 200V 2 WIRE "13-A" WH METER WITH CONTACT DEVICE FOR MEASURING THE 1φ 120/240V EMERGENCY LIGHTING LOAD
#4 - 1-5 AMP 380V Δ 220V Y "DS-9" WH METER WITH CONTACT DEVICE FOR MEASURING THE 3-SINGLE PHASE CIRCUITS FOR GENERAL LIGHTING LOAD SUPPLIED FROM 3φ BANK OF TRANSFORMERS
#5-6-7 3 800 AMP "W-12" CURRENT TRANSFORMERS.
3φ 4100V FEEDER FROM STATION "J"
3φ 4100V FEEDER FROM STATION "G"
#1
#1a
#2
#2a
#3
#4
#5
#6
#7
#8
#9
#10
#11
#12
#13
#14
#15
#16
#17
#18
#19
#20
#21
#22
#1 & 1a - T.P.D.T. PRIMARY AUTOMATIC OIL CIRCUIT BREAKERS
#2 & 2a - 3.P.3.T. PRIMARY KNIFE SWITCHES FOR DISCONNECT PURPOSES
#3 - REMOTE CONTROL T.P.S.T. PRIMARY AUTOMATIC OIL CIRCUIT BREAKER.
#4 - REMOTE CONTROL T.P.S.T. PRIMARY AUTOMATIC OIL CIRCUIT BREAKER
#5 - REMOTE CONTROL T.P.S.T. PRIMARY NON-AUTOMATIC OIL CIRCUIT BREAKER.
#6, 7, & 8 - 3-75 K.W. 2400-480V. TRANSFORMERS FOR 3φ 480 V. Δ GENERAL POWER LOAD.
#9, 10, & 11 - 3-100 K.W. 2400-480V. TRANSFORMERS FOR 3φ 480 V. Δ ELEVATOR POWER LOAD.
#12 - 1-25 K.W. 2400-120/240 V. TRANSFORMER FOR 1φ 120/240V EMERGENCY LIGHTING LOAD.
#13, 14, & 15 - 3-100 K.W. 120/240V. TRANSFORMERS FOR THREE SINGLE PHASE 3 WIRE 120/240V LIGHTING SERVICES.
#16, 17, & 18 - 3-"N.Q." FUSWITCHES.
#19 - 1-"6.E." EXPULSION FUSWITCH.
NOTE:- AUTOMATIC OIL CIRCUIT BREAKERS ARE EQUIPPED WITH OPERATING MECHANISM, RELAY, ETC.,
#20, 21, & 22 - REMOTE CONTROL CIRCUITS TO METER BOARD.

Fig. 2. Plan of meters and equipment for measuring the load to the Russ Building (left). Plan of transformers, switches and other vault equipment for the Hunter-Dulin Building. Each of these installations is typical of the general scheme of arrangements used at the two vaults.

Regulation

At the station end of each of the feeders 200-amp. induction regulators will be installed. In order to handle safely the emergency load that may come onto either of these feeders the induction regulators will be connected two in parallel thus giving capacity of 400 amp. This parallel connection reduces regulation from 10 per cent to 5 per cent but this is no serious drawback as the concentration of the feeder load at definite points on the feeder will make it possible to maintain the desired voltage at the load center with only 5 per cent boost or buck at the station end of the feeder.

Piers Support Tower Footings Along River Bank

The necessity of building a 220-kv. transmission line through an important industrial and commercial section of the City of Los Angeles forced the Los Angeles Bureau of Power and Light to choose a right of way traversing for some distance the river bed of the Los Angeles River. Even along this route practically all available space already was in use by railroad tracks utilizing both banks of the river. This condition caused the location of many of the towers directly on the steeply sloping banks of the river channel.

Construction difficulties inherent to such a tower site were enlarged greatly by the close proximity of important

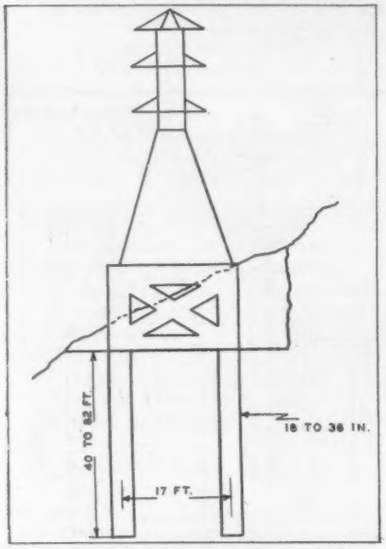


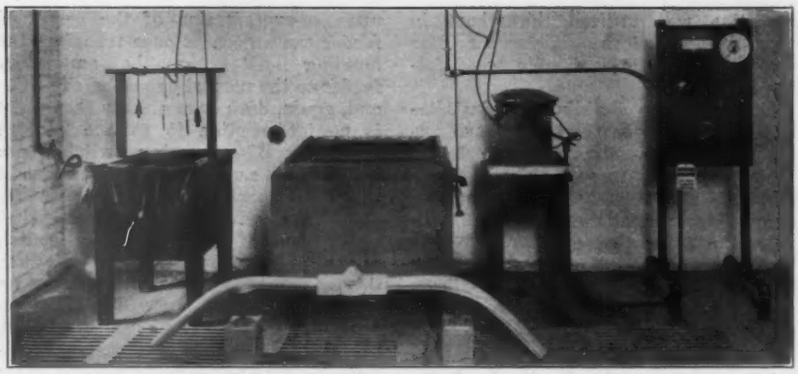
Fig. 1. Sketch indicating construction features of river-bank tower footings.

railroad tracks immediately adjacent to and above these tower sites. Thus extensive shoring was necessary to prevent tower excavation activities weakening the railroad roadbed. In one instance it was necessary to build a short wooden trestle to bridge a tower excavation.

Foundations for the towers thus located along the river bank must withstand both the jarring and pressure incident to frequently passing trains and the possible serious washing of river bank that may occur at times of excessive flood. A special tower footing such as that shown in the accompanying illustrations was devised. As may be noted in Fig. 1 the tower foundation proper consists of a reinforced concrete box resting upon four reinforced concrete piers. In fact the box and the piers are so constructed and interreinforced that the entire foundation is essentially a unit. Excavations for the piers varied in depth from 40 to 82 ft. and were sunk by means of a well drilling outfit using casings varying in diameter from 18 to 36 in. These deep piers are planned to carry the foundation bearing to a point deep enough to permit excessive washing away of the banks without damaging the tower.

The particular tower indicated in Fig. 1 was designed to carry standard 110 or 120-ft. double-circuit towers carrying two 3-phase 500,000-circ.-mil copper lines in suspension.

These river bank towers are designed to carry angles varying anywhere from 2 to 90 deg. Average tower foundations vary from 35 cu.yd. for 2-deg. angles to 88 cu.yd. for 41-deg. angles and 175 cu.yd. for 90-deg. angles. Fig. 2 (right) shows one of these special footings located close to the top of the river bank. Fig. 2 (left) shows one of the special footings wherein it was necessary to provide support for backfilling in order to protect adjacent railroad tracks.



Rubber testing equipment of Public Service Company of Colorado.

Regular Testing Schedule Keeps Safety Equipment Safe

By A. KANEKEBERG, Electric Distribution Department, Public Service Company of Colorado, Denver.

A definite testing schedule has been maintained by the safety and claim department of the Public Service Company of Colorado since 1920. In this schedule it is arranged that each month all of the rubber blankets, rubber gloves and rubber-lined hose used by the various crews for the month be brought in for test and replaced by new or tested equipment to be used for the succeeding month. In cases of particularly hard service the period of use between tests may be less than a month.

In the accompanying illustration is shown the testing equipment used for this work. Power for the testing equipment is supplied at 115 volts from one of the shop circuits. This is controlled through the board shown which contains a voltmeter, ammeter, circuit breaker, rheostat, indicator light and switch. The indicator light shows when the power switch is closed and the rheostat permits gradual excitation of the transformer. The transformer itself consists of a special core with a 1/100 ratio. The standard secondary voltage used for all of these tests is 10 kv.

All of the rubber safety equipment now is given a wet test with the exception of the line hose. The equipment used for testing the line hose is

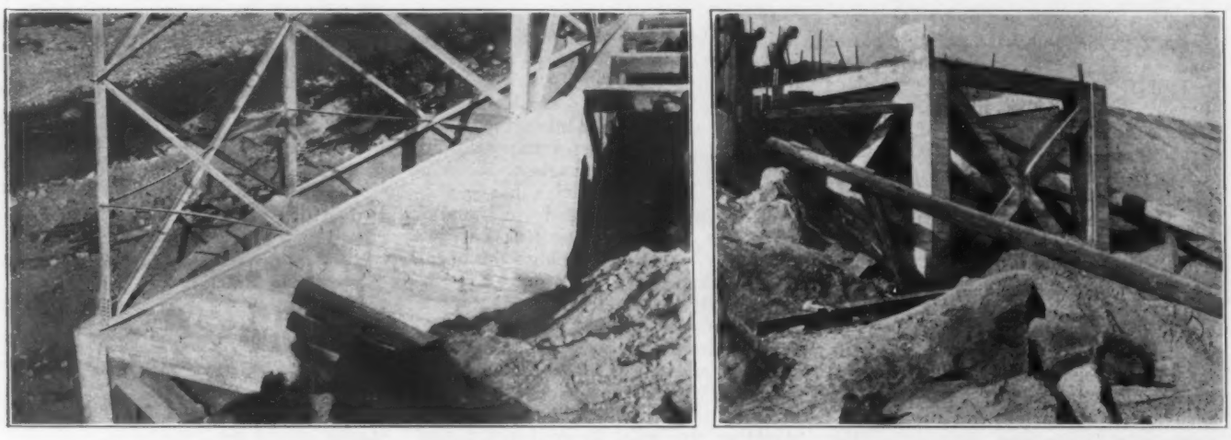


Fig. 2. Tower footing located near top of river bank (right) and footing designed for backfill support (left).

not shown in the illustration but consists essentially of a metal roller designed to fit inside of the hose and a metal casing to circumscribe the outside.

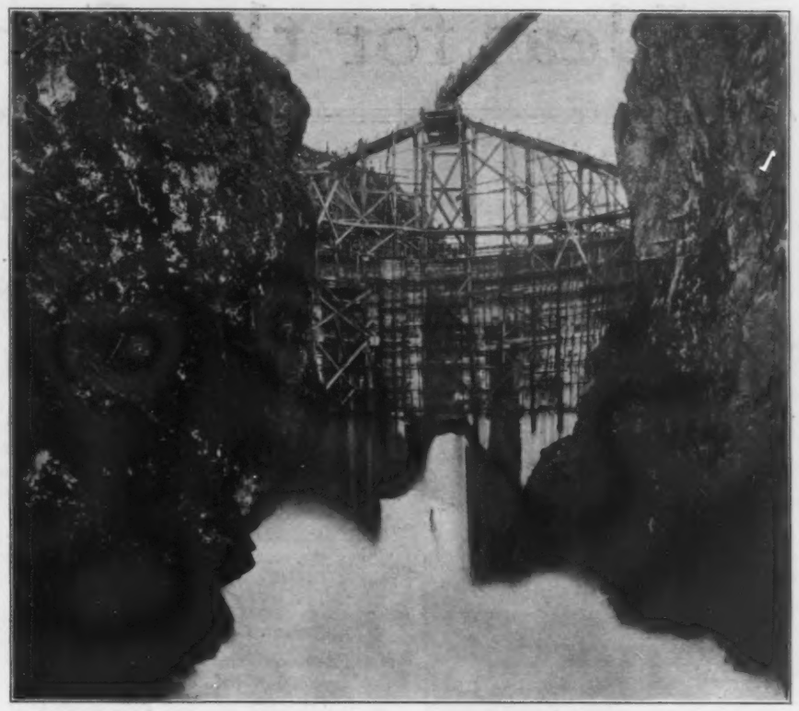
Because of the deteriorating effect of the dry test it was discarded some time ago in favor of the wet test. A great many experiments have substantiated the formation of O_3 during the dry test and its damaging effect on the rubber goods under test.

The blanket-testing equipment consists of a copper container grounded to one terminal of the transformer. The corners of the blankets are clipped forming a dish which is placed in the copper container and filled with water. The second terminal of the transformer is submerged in the water and any defect in the blanket will cause the passage of a current sufficiently large to be indicated on the ammeter. Each of these tests is run for a period of three minutes.

Rubber gloves are given a similar test in a similar way. The gloves are filled with water and suspended in a tank of water. Transformer connections are made, one side to the tank and the other side to metal strips placed inside the gloves, thus throwing full potential across the thickness of rubber in the glove.

All defective equipment is immediately destroyed. The testing equipment and system of testing has proved very satisfactory and has resulted in a record of no accidents occurring through the use of defective protective insulating equipment.

An Ideal Location for a Dam



Passing a flood estimated at 12,000 sec.-ft. through the Glines Canyon dam of the Northwest Power & Light Company on the Elwha River in the Olympic Mountains northwest of Seattle. This dam is to be 200 ft. high, but will contain only 20,000 cu.yd. of concrete; it creates a lake of 40,000 acre-ft. capacity and an operating head of about 180 ft. Due to the narrowness of the canyon at this site it was necessary to resort to a scheme of concrete placement wherein some of the aggregate was dropped into place from a vertical height of 75 ft.

Special Truck Used to Move 50-Ton Transformers

By A. F. DARLAND, Superintendent of Electrical Construction, Cushman Power Project, Tacoma Wash.

To transport four 50-ton transformers through five miles of Tacoma streets was one of the problems incident to the construction and installation of the Cushman substation at the Tacoma end of the Cushman 110-kv. line. It was solved by a local transfer company without damage to the streets or to the equipment. Four 14,100-kva., 105/50-13.2-kv. transformers for the substation were shipped from the Allis-Chalmers factory with the cores in the tanks and the tanks full of oil so that it would be unnecessary to dry them out before placing them in service.

A special 16-wheel transport was built on which to support and carry them. This consisted of four 4-wheel trucks set in the form of a square and held together by timbers. Wheels were steel-tired of 16-in. face and 2 ft. in diameter. A transformer was suspended from a point above its center of gravity in a cradle between the four trucks as shown in Fig. 1. Supports were so arranged that the bottom of the transformer was but a few inches above the ground so that if any supporting member failed the transformer would not have far to drop. The cradle was so constructed that the transformer readily could be jacked up if necessary to permit it to pass over any slight irregularity in the roadbed traversed. Motive power for hauling on level ground was furnished by a 10-ton caterpillar tractor. However, for a part of the distance a 1½ per cent grade on a gravel road necessitated additional hauling power in the form of two 5-ton trucks and one 2½-ton truck. The hauling trucks had to be ballasted with sand to secure traction.

Fig. 1. Two 5-ton trucks, a 2½-ton truck and a 10-ton tractor hauling a 50-ton transformer through Tacoma streets.

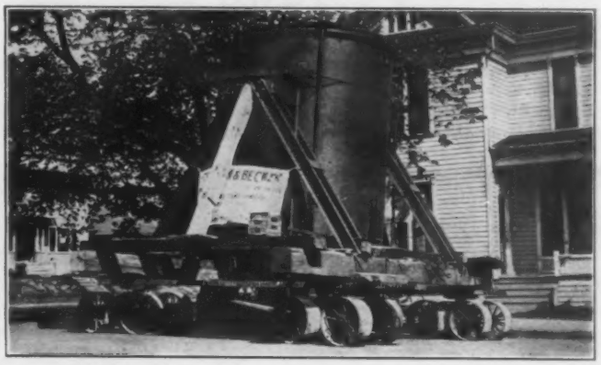


Fig. 2. Special transport consisting of four 4-wheel trucks tied together by a timber framework.

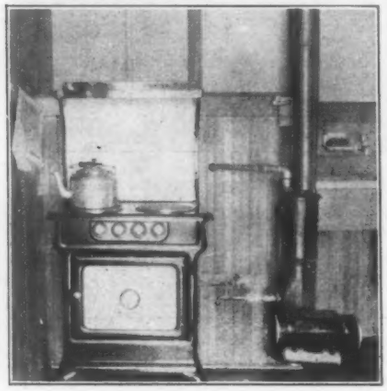
Ideas for the Contractor

New Field for Electric Cooking in Summer Auto Camps

Service of Electric Hotplates or Small Ranges to Travelers Utilizing Auto Camps Being Extended to Complete Electric Cottages

WITH the increase of motor travel the auto camp has come into its own. No city of any size is without one. Even the countryside is amply furnished with numerous auto camps of more or less elaborate character.

The city auto camp, built within the territory served by gas lines, has set a



Small range in kitchens of summer cottages at Calistoga.

standard of convenience which until recently placed the country auto camp somewhat at a disadvantage. However, with electric service available practically anywhere along the highway systems of the Pacific Coast region a natural development has been the employment of small electric ranges in the cottages run in conjunction with the better auto camps.

Some of these are more elaborately and completely fitted than others. Some merely have a central kitchen in which a number of electric hotplates are available to those campers as may wish to use them. This arrangement, however, merely scratches the surface of the possibilities for the extension of electric service into the auto camps and the building of a market for further electric installations both in wiring and in equipment.

As a rule the auto camp installation is made upon a master meter, the camper being charged a flat rental for a cottage containing an electric range or other equipment. Such an arrangement has the advantage of economy and reduces the size of the monthly minimum charge on the installation.

Calistoga Cottages an Example

Photographs on this page illustrate one such example. In Calistoga, Calif., an installation of four ranges in four summer cottages was made last year by Harry Decker, electrical contractor in Calistoga. The houses are in a summer colony run by A. Banchieri, who rents the cottages for a flat rental including the electricity for the cooking. The small D-97 Universal ranges are installed in these cottages.

Another photograph shows the grouping of the circuits from the four cottages on one master meter located on the house of the owner.

Advertises Electric Cottages

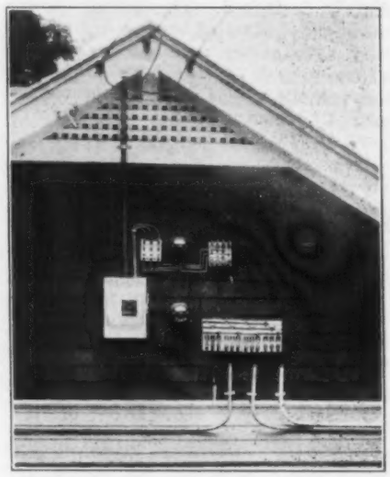
An even more complete installation is one at Shell Beach, near Pismo, Calif. Here the owner, William Boeker, has a large sign visible from the main traveled highway advertising the electric cottages. These cottages contain a combination living room and bedroom, dressing room, kitchenette and lavatory. A small electric range is installed in the kitchen of each cottage as well as an electric water heater.

Hot salt water baths are also available at this camp. The water for these is also electrically heated. Fresh water baths are also served from electrically heated tanks for both tub and shower baths.

Master Meter on All Cottages

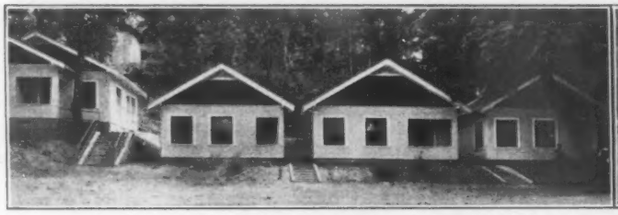
As in the other installation previously mentioned one meter is installed for the entire group of cottages. The Midland Counties Gas & Electric Company serves the group. Large street lights and ornamental lights are installed near the cottages. Inside the bath house good lighting prevails. A 5-kw. water heater is installed in the home of the owner in a 40-gal. tank. The owner uses a 7-kw. super-automatic range.

A pump connected to the line from the ocean automatically keeps the bath house tank full. For fresh water a pump at a well also automatically keeps the fresh water tank full.



Arrangement of circuits of four ranges on master meter located at owner's premises.

The cottages are floodlighted and attention is drawn to the fact that they are electric by the large signs on the tank house. Highway lighting units are used on the street. The installation of wiring was made by Cline's Electric Shop, San Luis Obispo, Calif.

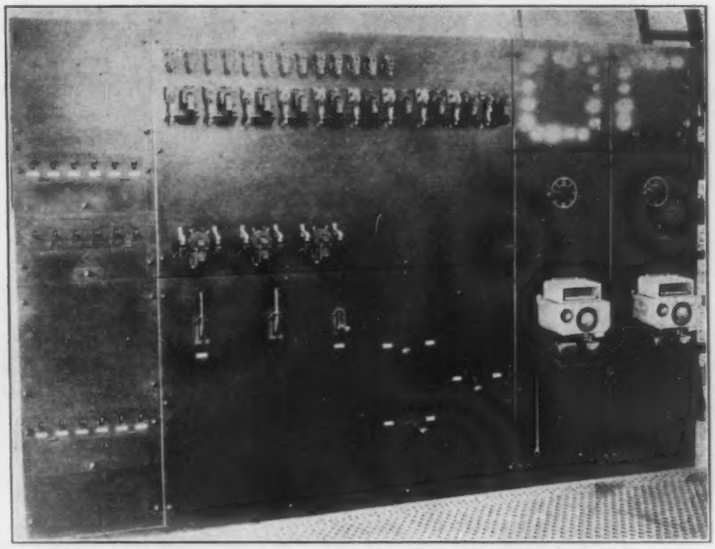


Summer cottages at Calistoga, equipped with electric ranges.

Full electric cottages at Shell Beach, having range, water and air heat.

Oakland Protects the Pedestrian in Its New Traffic Control

System Designed So That Pedestrian May Know Definitely That He Must Also Abide by Signals



Control panel for automatic operation of Oakland's' traffic system.

TRAFFIC is traffic, whether afoot, on horseback, bicycle, motorcycle or automobile. This was the conclusion reached by the City of Oakland in its investigation of the traffic problem in its downtown district while considering the installation of an up-to-date traffic control system. As a result of studies of the traffic control in other cities this conclusion was reached and to meet it a system of control signals having many novel features was designed.

Traffic signal systems are no new thing. They have been experimented with and used by a great many cities. There seems to be little uniformity as to practice or methods. The types of signals range from semaphores to light or audible signals or combinations of all three.

Oakland, with its special traffic control idea in mind, designed a system. Then bids were called for to furnish a system which would comply with its specifications. The Essco Manufacturing Company was awarded the contract for the signals and the automatic timers upon this basis. The switchboard was manufactured by Brown & Pengilly, and the system was installed by the City of Oakland electrical department.

The design of the system was conceived by Carl E. Hardy, superintendent of the electrical department. He was assisted by George V. Tudhope, assistant superintendent.

The first unit of the system was installed in the downtown district of Oakland to control the traffic for ten street intersections.

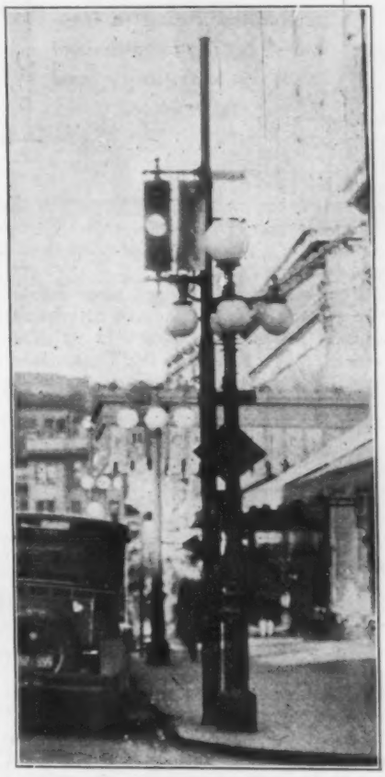
Designed with Pedestrian in Mind

The entire system was designed with the pedestrian in mind. The system uses a three light signal with vibrating bell, hung on a bracket at the four corners of each intersection and visible from each of the sidewalk corners. The top light is a red one, marked "Stop," the next light is an amber one with a plain marking, "Ped'n," standing for pedestrian. The bottom light is a green one, marked "Go."

When the need for traffic regulation arose, the city engineers visited a number of cities to inspect their traffic systems. Everywhere they were confronted with elaborate automatic devices for vehicular control, but the pedestrian was seemingly ignored. A green light would flash, motors and street cars would speed forward, often turning to the right or left and endangering scurrying pedestrians. Wherever three lights were used (red, amber and green), the amber "caution" light only served as a signal for the motorist to "beat the red stop signal" and this further endangered the pedestrian.

System Operation

The system now operates as follows: At the beginning of a triffic interval (which may be determined and set for on the control board located in the city hall basement) all signal lights flash the red "Stop" signal. Immediately following the red flash and with the red still on, the yellow pedestrian light is flashed on two of the corners. This allows pedestrians to start across the street and gives them from 4 to 7-sec. start of the vehicles, which are not signaled to "Go" until this interval has elapsed, the yellow and red then going off at those two corners and the green "Go" signal coming on. This allows the pedestrians to reach the center of the intersection before the vehicles start, some of the latter making a right-hand turn which would otherwise endanger pedestrian safety.



Traffic signal at intersection with pedestrian signal lighted.

The entire system is operated simultaneously, the "Stop" and "Go" signals being given on alternate blocks at the same instant. In this way a car traveling at approximately 15 miles an hour, the legal speed in the city in congested districts, can continue without stopping for several blocks.

Automatic Switchboard Control

The particularly interesting feature of the Oakland traffic control system is to be found in the switchboard located in the city hall basement from which the entire system is operated. As may be seen in the accompanying photograph the right-hand end of the board consists of two panels of identical equipment. On the lower part of the panel is located the automatic timing mechanism driven by a small motor. On the face of the timing dial may be set the intervals for each of the signal lights or the bell.

By means of contactors actuated from relays in the timing mechanism the entire system is operated in unison. Two panels with identical equipment are provided in order that one may be switched on to relieve the other in case of breakdown or trouble in the timing mechanism, thus providing continuous operation.

Above the timers are a number of pilot lights arranged in a square to represent a typical street intersection. Each side of the square consists of four lights, each light representing a corresponding light or signal at every street intersection controlled by the system. A red pilot light corresponds to the red "Stop" signal, an amber pilot to the amber pedestrian signal, a green pilot to the green "Go" signal and a blue pilot represents the bell or gong which is rung for each change of signal. The bells are rung for approximately one second.

Thus the automatic control may be checked by the operator occasionally by checking the intervals of the light flash of the pilot above the timing mechanism.

The center panels of the switchboard contain the contactors and switches for the system. Ample space has been left for the enlargement of the system as the future demands in the central district of this city may require.

St. James Court, Hayward, a Red Seal court of sixteen homes. At right are George Eldridge, field representative, California Electragists; H. A. Fenneman, electrical contractor; James Willison, builder, and Hugo Frank, electrical contractor.

Where Red Seal Eliminates Competitive Bidding

Builder in Hayward Finds Satisfaction in Fact of Standard Job of High Quality at Known Cost and so Awards Wiring Specifying Red Seal

IF COMPETITIVE bidding could be eliminated, what electrical contractor would not think the millennium had arrived. Add to that the fact of receiving a good and wholly adequate price for the work done and the electrical contractor might well think the Day of Judgment had come.

Yet with the Red Seal Plan in operation in the little city of Hayward, Calif., these two much-wished-for conditions have been brought about in the building of a court of homes.

James Willison, builder and contractor of Hayward, some months ago started the building of a group of 16 residences arranged in the form of a court in one of the newer residence districts of Hayward. As customary with undertakings of this kind, Mr. Willison started the first home and sought bids for the electrical wiring. A bid was furnished him but at the same time the electrical contractors of Hayward spoke to him of the advantages of the Red Seal Plan. The builder was convinced of the worth of this plan and asked for the figures on the additional cost to bring his homes up to Red Seal requirements. When he was informed of the slight additional cost he authorized one of the electrical contractors to do the first job on the Red Seal Plan, and made application for the Red Seal. As each house he was building was brought to the stage at which wiring should begin he called in one or the other of the electrical contractors and gave him the job of wiring the home without even asking for a price. He specified that it must be Red Seal.

Red Seal has standardized home wiring in Hayward, setting the standard high in adequacy and convenience.

Just as fast as houses were started the electric jobs were given alternately to the electrical contractors of Hayward. Hugo Frank of the Frank Electric Company would be given one house to be wired Red Seal and Henry H. Fenneman of the Hayward Electrical Company would be given the next one. There was no question of competition and the friendliest of relations were maintained throughout the whole proceeding.

Mr. Willison, the builder, liked this plan much better. He said that he knew definitely what his wiring would cost and was able to forget that item of the building operation in planning each successive home. He knew that the homes would be wired to give adequacy and to conform to the highest standards approved. He knew that the homes would be inspected by the Bureau and labeled with the Red Seal. From a selling standpoint the Red Seal would indicate that the wiring had received as careful attention as had the other details of the building construction and had been passed upon as to its convenience.

As the result of the operation of this co-operative activity in Hayward that little city registered the highest of its class in the number of Red Seal homes completed during 1926. In future building, the plan having proved successful, there is every indication that the Red Seal will be extended over other homes this contractor builds and that price competition will be eliminated to a large extent, each electrical contractor in turn being given orders to produce a Red Seal home.

How One Contractor Built Up Motor Service Work

By HAROLD J. ASHE.

EIGHT years ago A. R. Dunn started in the electrical contracting business in Long Beach, Calif., then a city of 40,000. At that time he had practically no money invested in the business, and his present investment has come from the business itself. At that time there were seven or eight other contractors in the city, and no particular reason for more, yet Mr. Dunn entered the field and thrived, for he made a reason for his business existence.

Mr. Dunn knew that Long Beach had a lot of factories and canneries depending upon electricity for their power. He further knew that when they had motor trouble they were forced to send to Los Angeles for help, and while men were

coming from Los Angeles the factory in distress was losing time and money by the shutdown of power. Mr. Dunn felt that here was his logical field to cultivate. He therefore set out to specialize on power service work, and now has almost entire control of this type of work in the city, and he commands regular Los Angeles rates for the work.

Motors Loaned in Emergencies.

"We have $3,000 worth of motors on the floor and when a motor user gets in trouble we are almost invariably able to substitute one of the motors on the floor for the one about to be repaired," stated Mr. Dunn. "We do not charge the customer any rent for this motor while we are repairing the faulty one, except in occasional instances. This, of course, is governed by the nature of the work. Maybe we charge for one out of twelve.

"We also rent motors to temporary users. At the present time we have twelve out, ranging from thirty-five horsepower on down."

The shop equipment of the Acme Electric Company is most complete. It includes a lathe, turning armatures, cutting key, winding machines, coil machine, cutting machine, electrical oven and air compressor. Each machine has its own motor. Besides this there are about $500 worth of small special tools in the shop.

Mr. Dunn explained that a large part of the firm's success in industrial work was traceable to its policy of always being ready to give quick service.

"We give service on short notice," declared Mr. Dunn. "We have three trouble shooters ready day or night, Sundays and holidays, as well as throughout the week, to answer calls immediately. Our customers value this, and depend on us."

The firm also does quite a bit of millwrighting, and also general electrical contracting, but does little over-the-counter retailing.

Developing a specialty and advertising it both by good work and by mailing pieces, and conducting the business on a paying basis, is possible in electrical contracting, as this article describes.

Sends Blotters to Customers

"We use display advertising in the newspapers," stated Mr. Dunn, "but do not recommend it. It is not particularly suited to the peculiar needs of our business. Direct-mail answers our purpose much better.

"With newspaper advertising we were reaching an audience of 50,000, most of whom were not potential customers. We were paying for this coverage. By using direct mail we reach only those we aim to, and pay a much smaller sum for so doing. We have about three hundred names on our mailing list, including people in Wilmington, San Pedro and Terminal Island. We mail to this list blotters once a month, sometimes every two or three weeks, the copy on which we change about twice a year. This list comprises both prospects and customers.

"In the case of prospects we endeavor to make a personal call and get direct contact, prior to placing this person's name on our mailing list. Thus the blotter has added weight as a reminder of our services."

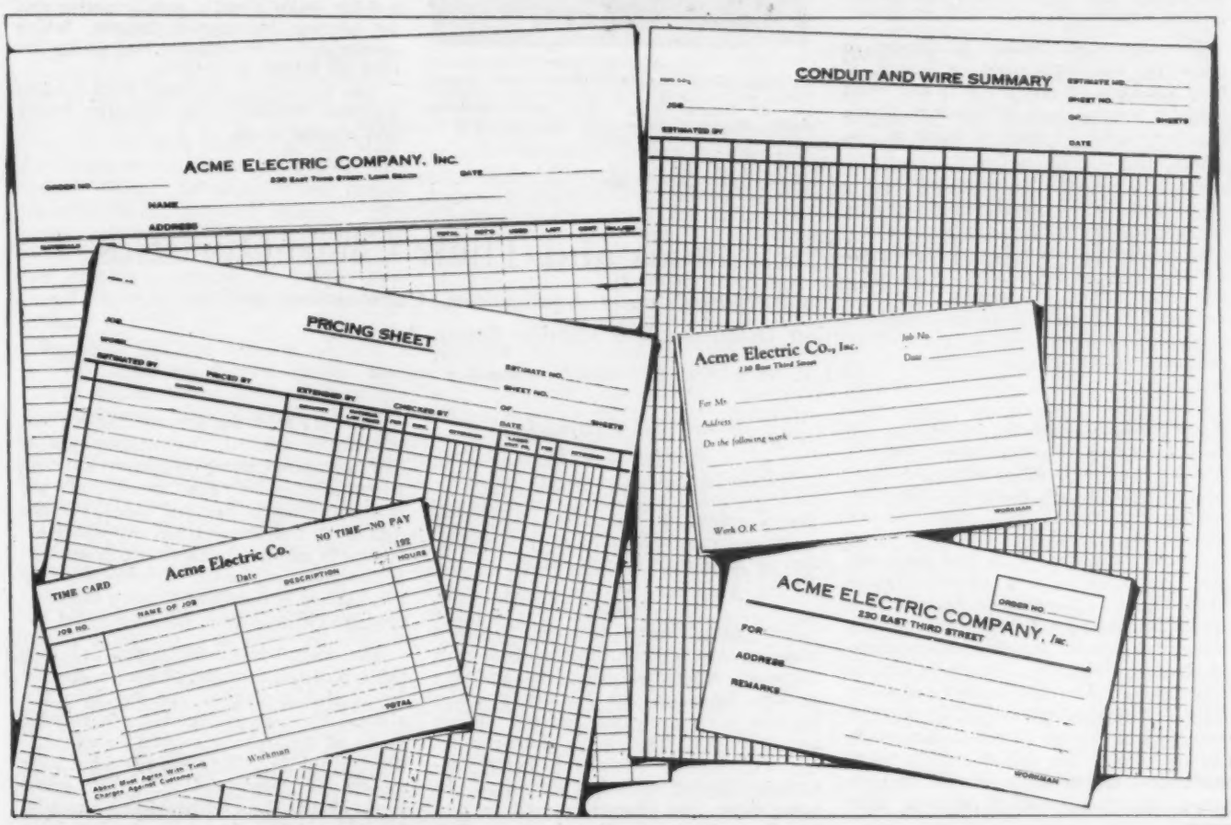
Fair Treatment of Employees

Possibly one of the biggest factors in the success of the business, is the firm's treatment of employees. Journeymen receive $8, $8.50 and $9 a day on the open shop plan, which is a little better than the union scale.

The Acme Electric Company pays one-third of the employees' liability and property damage insurance. Besides this the men are allowed a stipulated mileage rate for their cars. Each man owns his own car, for the use of which he is allowed 5 cents a mile, or if he hauls anything for the firm the rate is 10 cents. This mileage is applicable from the shop to the job (if the men must report at the shop first) or from job to job (if they are on more than one job during a day). However, this mileage, naturally, does not apply from the employees' residence to the job or shop.

Heavy hauling is done by a truck, a driver for which is maintained.

The firm now employs eight men, besides the estimator and office help. It



Accounting and estimating forms used by Acme Electric Company of Long Beach.

ordinarily employs from twelve to fourteen men, and has had as high as twenty on the payroll.

Costs Studied and Tabulated

Special attention has been given by Mr. Dunn to placing the firm on an afficient basis, where costs will be known at all times. From eight years' experience forms have been gradually evolved that fit the peculiar needs of the business. Some are stock forms, some are stock forms with variations, and others have been made expressly for the firm. Several such forms are reproduced herewith.

One form used is an estimating or pricing sheet. This has space at the top for name of the job, work to be done, by whom estimated, priced by, extended by, checked by whom and the date. Also a place is left for the estimate number, sheet number and number of sheets comprising the total estimate.

Beneath this heading appear spaces for an itemized list of the material and quantity, material list price, discount, net price, labor unit price, and total. This estimate sheet is kept on all jobs and is used for future checking on jobs actually performed.

Another form is a check used on the total amount of conduit and wire for a job, and is self-explanatory.

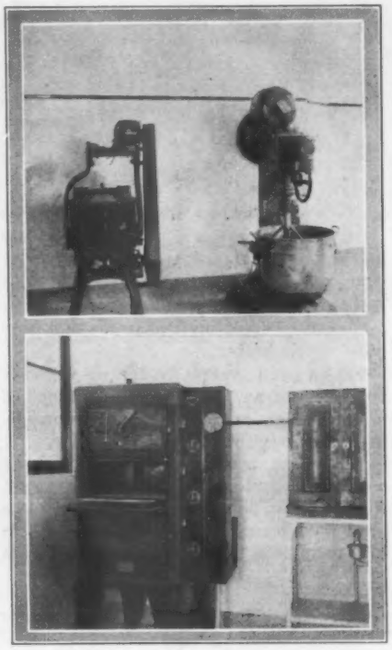
A third form is a check on materials used on a given job. This provides space for the material, date taken on job, the total, amount returned, amount used, list, cost, and billing.

An envelope is used in listing work to be done on a certain job and given to workman, who signs upon completion and has it O. K.'d.

The time card usually is handed in daily by the employees, although if they are kept on one job they can hand it in for several days on one card. Space is provided for job number, name of job, description and number of hours. Several lines are provided for workmen on several jobs in one day. The cards are then turned over to the bookkeeper for proper recording against the various jobs. Whether a job is on contract or not this work is charged up to the job, as is material. Thus when the job is finished, the total amount of material and its cost, plus the cost of labor, gives Mr. Dunn and his estimator a check against the estimated cost of the work. Over a period of years it is possible to work out an almost infallible figure on any type of job that will prove profitable to the firm. Seldom does the Acme Electric Company lose money on a contract due to under-estimating.

"Honesty and service, coupled with fair treatment," continued Mr. Dunn, "I believe has built up our firm to its present position in the contracting field. We aim to give value for money received. We have a service to offer and one price for that service. Price cutting in this business doesn't pay. It has been tried and doesn't thrive."

Mr. Dunn is president and manager of the Acme Electric Company, which is a corporation, incorporated in October, 1922. The company is a member of the California Electragists, Southern Division. O. C. Seaver is secretary and treasurer and R. C. Sherman is vice-president. Both of the men associated with Mr. Dunn are journeymen. Bert M. Green has been with the firm for the last seven months as estimator.



Above: electric potato peeler and dough mixer in the Holy Cross School and Orphanage at Santa Cruz. The lower picture shows the 6-kw. bake oven also installed at this school.

Electrical Equipment Used in Orphanage

Even the modern orphanage is electrically equipped. At least the Holy Cross School and Orphanage at Santa Cruz, Calif., recently installed by the Cox Electric Company of Santa Cruz is complete in its electrical equipment of both kitchen and laundry.

The total connected electrical load for this orphanage is approximately 40 kw., 20 kw. of which are in the kitchen. The kitchen contains a Hobart dough mixer, a 6-kw. bake oven, a potato peeler and an electric ice cream freezer, which shows that even orphans may enjoy the best of things nowadays.

The laundry is equipped with electric washing machines, an electric ironer and several irons.

Electric Heat—Furnaces and Their Characteristics

Kinds of Electric Furnaces, Their Applications, Construction and Operation Discussed and Further Study Advised

By J. R. Wilson*, Quality Electric Works, Los Angeles

Electrical Estimating Series XXIII

INDUSTRIAL heat can be divided into two classes of application, namely medium and low-temperature application. Furnaces are classed as medium temperature installations and usually operate from 1,000 deg. F. to 2,000 deg. F. Ovens are classed as low temperature installations and operate below 1,000 deg. F. The electric furnace is a device for heating substances, melting substances, converting one material into another, or heating a charge until its ingredients react chemically upon each other. Alternating current is usually employed in electric furnaces because it has no electrolytic effect and is more economical to transmit. Direct current can, however, be used if desired. The useful effect is dependent upon the wattage consumed, and not on the voltage or amperage of the current.

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Classes

For convenience electric furnaces may be divided into three classes: arc furnaces, resistance furnaces and induction furnaces. In the arc type the heat is created by the current arcing across a gap. The arc is struck in an enclosed space, the heat being reradiated by the walls to the charge. In some types the charge is used as one terminal of the arc, thus being melted by contact with the arc and the current passing through it. In another type of arc furnace, using 3-phase current, three electrodes are used and the charge forms a neutral point for the action of the three arcs. As the electrodes in all arc furnaces are consumed gradually, a motor-driven feeding mechanism is provided to keep the electrodes at the correct distance apart.

The electrodes usually are fed into the top of the furnace, although in some types the electrodes are fed into the sides. Furnace electrodes are usually made of amorphous carbon or of artificial graphite. They are provided with means of "end-jointing." In some types this is done by providing threads, in others by a dowel or similar joint

held together with electrode paste. The purpose of "end-jointing" is to allow the electrodes to be fed continuously. In one type (Soederberg) the electrode is produced and fed into the furnace in a continuous operation. Some types of furnaces are built to tilt or rock on their bases to permit the molten metal to be poured from the furnace instead of "tapping" it.

In the resistance type of furnace, a solid or liquid resistor is used, the current being passed through it, thus producing the required amount of heat. The conversion efficiency (from electrical energy to sensible heat) is claimed to be 100 per cent by this method. The resistor may take almost any form; solid block, rod, wire, granulated, solid material, or liquid bath. The substances to be heated are brought into proximity to the resistor, in contact with it, mixed with it, or used as the resistor itself. Most heat treating furnaces are of the resistance type, the granular resistance material being placed in troughs. Small furnaces and muffles usually are built of this type, using resistance wire or rod.

The induction type of furnace operates on the same principle as a transformer. The core of the transformer passes through the center of a ring-shaped crucible, or hearth. This crucible is used to hold the metal bath which thus forms a one-turn or short circuited secondary. In this mode of operation the metal bath carries a high amperage at a low voltage, and will be heated to a high degree. This type of furnace has a low power factor.

Principal Applications

The most important application of electric furnaces is in the production of high grade steel and steel alloys. Steel made in these furnaces shows a high strength and more uniform quality than that made by means of fuel-fired furnaces. Owing to absence of flaws, "electric steel" is very desirable for shafts, axles, gears, or other parts subjected to extreme stresses. In making thin castings, electric steel has also shown its superiority over open hearth steels.

Furnaces for the melting of brass, zinc and other non-ferrous metals, are mainly of the arc or resistance types. These furnaces usually are of comparatively small sizes and are therefore designed for single-phase current. The top of the furnace being closed reduces the losses, due to vaporization, in a very large degree, especially in the melting of zinc. These furnaces have been known to show savings of $5 to $10 per ton over the fuel-fired type. They have proved particularly efficient in the melting of refractory alloys such as cupro-nickel.

Electric furnaces are used in a great many ways in the electrometallurgical and electrochemical industries. Among the many products produced are carborundum, graphite, aluminum, calcium carbide, calcium cyanamide, alumina, and many others. Many compounds and metals cannot be produced except by means of the electric furnace. These furnaces also are used for the fixation of atmospheric nitrogen.

In the heat treatment of steel, accurate control of temperature is absolutely essential. The furnaces used are usually of the resistance type and the temperature control can be automatically regulated within any desired range. For large output these furnaces are built of such size that the product passes through the furnace on cars or conveyors. Furnaces for electric steel production vary in size from one ton capacity to as high as 40 to 50 tons at one charge.

For vitreous enameling a special type of resistance type furnace is used. This is used for enameling bath tubs, lavatories, kitchen ware, reflectors, etc. The temperature required is from 1,600 deg. to 1,700 deg. Electric furnaces built for laboratory use are generally of the muffle or tube type. The heating element is usually of resistance wire or ribbon. These furnaces are used for heat treating, jewelry enameling, fusing optical glasses, and in dental and chemical laboratories. Another type is built on the induction principle, inducing eddy currents in the material to be heated.

Due to the intense heat developed in the electric furnace, the walls must be lined with material of special character, of high heat resisting qualities. Some linings are applied in a plastic form, while others are of magnesia bricks. The kind of refractory to be used with any particular furnace depends upon the product of the furnace, whether basic or acid process, type of furnace, and whether the furnace is to operate continuously or intermittently. The different classes of raw materials are listed as: Basic—zirkite, dolomite, bauxite, magnesite; Neutral—zircon, silicon, carbide, carbon, chromite; Acid—fire clay and silica.

Equipment

In considering the types of equipment used to apply electric heat as a means of changing the structure, composition or state of metals, chemicals, liquids or gases only brief consideration can be accorded to each type. All of this equipment is worthy of the estimator's earnest study, primarily because of the size of electrical installation necessary to place the equipment in operaction. The types will be considered in the logical sequence in relation to the discussion which has gone before. Further data may be obtained from manufacturers of the equipment mentioned.

Most basic bricks are made from bauxite or magnesite which has great resistance to heat but poor mechanical strength. Magnesia is a form of calcined magnesite, a mineral 90 per cent to 96 per cent magnesium carbonite. This material, while quite resistant to slag and limestone, is very sensitive to silica. It is usually laid in the furnace in a thin mortar of powdered magnesia and tar. Chromite, mixed with fire-clay or bauxite is used to manufacture neutral bricks. This produces a mixture which is practically infusible, and these bricks are used as a neutral course, between fire clay and magnesia bricks, in open hearth furnaces.

Pure silica, and about 2 per cent of lime (by weight) is used to make silica bricks. Ganister bricks (another form) are intermediate between fire clay and silica bricks. They are made without the lime binder. Silica bricks are acid in their reaction. They are very largely used in the construction of furnace roofs. In using any of these materials the fact should be borne in mind that in the presence of a basic charge, basic materials should be used, while with an acid charge, acid materials should be used. No known material now in use is a perfect refractory in every particular, so a choice must be made according to the particular need.

A final summary of the advantages of the electric furnace reveals a high grade of product from comparatively cheap materials, combined with economy of operating cost, plus automatic or semi-automatic temperature control. Where the induction furnace is used, a charge of pure steel scrap mixed with pig iron produces a product similar to crucible steel. In the arc type of furnace, a charge of cold steel scrap covered with a slag containing a high percentage of lime and brought to a high temperature, produces very high grades of steel. The reaction which takes place eliminates all of the impurities, sulphur, manganese, phosphorous, carbon and silicon. The introduction of the necessary alloys produces the proper composition. That the electric furnace is rapidly forging to the front in the production of electric steel is indicated by the fact that this product reached a total of 432,526 tons of ingots and castings in 1924.

There are many manfacturers of electric furnaces and many different types of furnaces in each of the classes mentioned herein. The number is too great to attempt to mention each maker. The following list will serve to provide a source of authentic information for the estimator who wishes to acquire further knowledge.

Ajax Electrothermic Corp., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
General Engineering & Supply Co., New York, N. Y.
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Booth Electric Furnace Co., Chicago, Ill.
Greene Electric Furnace Co., Seattle, Wash.
Pittsburgh Electric Furnace Co., Pittsburgh, Pa.
Detroit Electric Furnace Co., Detroit, Mich.
Electric Furnace Co., Salem, Ohio.
Wile Electric Furnace & Eng. Co., New York, N. Y.

Better Merchandising

"They Went to the County Fair—"

All the Folks Around Were There to See the Electrical Displays—A Symposium of Ideas on Exhibits for Dealers and Central Stations

WITH a display of many new appliances demonstrating the economic use of electricity on the farm, the Puget Sound Power & Light Company, Seattle, showed its now famous farm exhibit at the Western Washington Fair, Puyallup, last fall. At the time the company commenced exhibiting at this annual fair some years ago, it erected a model electric home and several farm buildings of permanent construction so that they could be used each year. A regular space consisting of one-half of one of the largest buildings is allotted to the company, and this year a decorative lattice was added across the top of the entire length of the exhibit while the permanent buildings were freshly painted and refurbished. Behind lattice work fences a series of booths or buildings contained the latest developments in electrically driven machinery, equipment or appliances applicable to different kinds of farming.

Above: the attractive refrigerator display of the Newbery Electric Corporation of Los Angeles at a recent fair. Below: the booths of several electrical contractors of Bakersfield at a fair.

Electric Home a Feature

One of the principal features of the exhibit was the complete electric home, where every sort of household appliance was demonstrated. Beside the always interesting electric kitchen, the feature of this part of the exhibit which attracted the most attention was the electrically driven domestic water system, which supplied a bubbling fountain in the back yard of the cottage.

Several new or improved appliances for many kinds of farm work also proved to be of outstanding interest to visitors. Among these was the underheat brooder recently developed by engineers of the Puget Sound company in collaboration with the agricultural experiment station of western Washington. A new style of incubator which is giving satisfaction to large hatchers also was an interesting part of the display of equipment for the poultryman.

In the dairying exhibit a new milk cooler and a sterilizer for milk containers were shown for the first time. The need for such equipment for the small dairyman, whose business will not warrant the installation of a large refrigeration plant and steam boiler, has been felt for some time, and only recently has been made available. The new electric milk cooler not only reduces the temperature of fresh milk to 40 deg. but also has a storage chamber where this temperature is maintained until the milk is taken out for shipment.

Motors for Farm Uses

A new 5-hp. portable utility motor was also an interesting addition to this year's exhibit. It was displayed driving an ensilage cutter. An electric power lawnmower, with 200 feet of feed cable, was another item of interest to many that were attempting to maintain large lawns. For the nurseryman and the amateur flower and truck gardener a new electric hot bed was a welcome innovation. This device, which warms and keeps constant warmth in the earth used to start flower and vegetable plants, was also developed by the company's engineers. The irrigation exhibit was made real and vivid by displaying a 3-hp. motor driving a 2-in. centrifugal pump delivering water to a tank. From here the water was led through pipe into ditches running between rows of growing vegetables that had been transplanted from a nearby irrigated farm. Visitors were shown that growing a second crop of such produce was possible only by irrigation.

Many other pieces of electrically operated farm equipment were displayed with effect. Practically all were shown in actual operation while demonstrators explained their uses and application. Beside the visiting farmers, several health officers and dairy inspectors ex-

These are samples of the type of homes illustrated in the exhibit of over forty Tacoma houses wired by the Blue Bird Electric Shop whose photographs formed a feature of the company's booth at the Puyallup County Fair. A prize was given the contestant who could identify them all.

pressed satisfaction at the appearance on the market of some of the new equipment. The fair attendance was approximately 160,000.

Five Contractors Display at Fair Together

Five electrical firms co-operated during the fair held in Bakersfield, Oct. 6-12, 1925; Jason Electric Company, Bakersfield Electric Company, Star Electric Company, Jim Baker and San Joaquin Light & Power Corporation's retail store. All of them secured space in a row. This made a co-operative exhibit at the Fifteenth District Agricultural Fair.

The five firms constructed a power line in front of the exhibits. Each pole had a 200-watt lamp installed on it. As the power line had on it only 110-volt lighting service one leg of this miniature power line was dead. This was used as an antenna for demonstrating radio.

Advertising Home Wiring by Samples of Work Done

A new method of advertising its home wiring department was recently inaugurated by the Blue Bird Electric Company of Tacoma at the Puyallup County Fair in the form of an exhibit of homes which had been wired by the company. This consisted of some fifty photographs of attractive residences in Tacoma, all of which had patronized the contracting department of the Blue Bird shop.

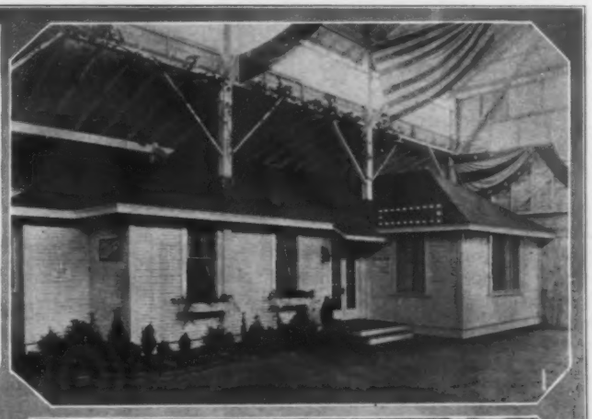
In order to attract attention to this feature, an electric washing machine was offered to anyone identifying all of the homes shown. Great interest was shown in this exhibit and many entered the contest, although none were successful in placing all of the homes shown.

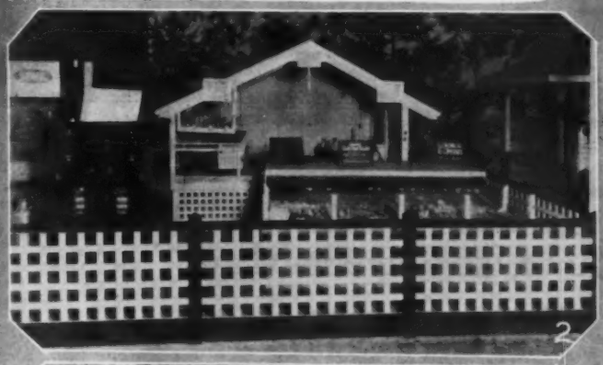
As a result of the features, however, many hundreds of residents of Tacoma were impressed by the number and character of homes wired by the Blue Bird Electric Company.

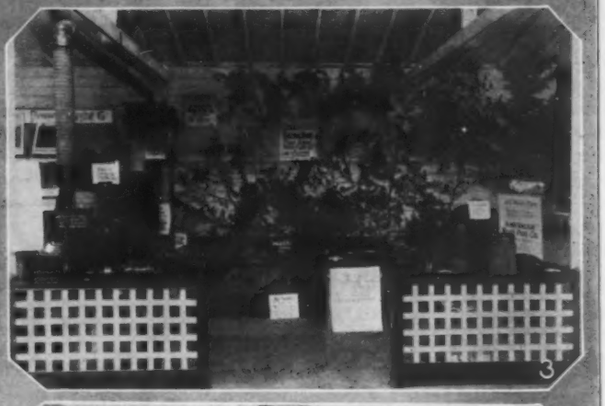
Retail Store Publication.—A rather complete volume on retail store problems published by the Domestic Commerce Division of the U. S. Department of Commerce, known as "Domestic Commerce Series, No. 9," has been announced as available at any of the branch offices of the Department of Commerce. The book is divided into eight parts, headings of which indicate how completely the subject is covered. These divisions are: Measuring a Retail Market, Retail Store Location, Retail Store Planning, Budgetary Control in Retail Store Management, Education of a Retail Sales Force, Co-operative Retail Advertising, Department Leasing in Retail Stores, and Vehicular Traffic Congestion and Retail Business.

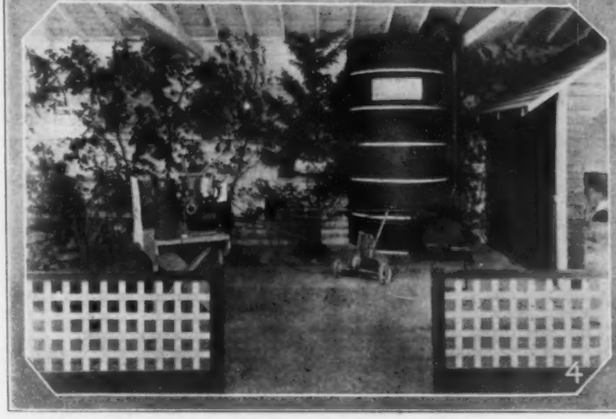
Farm Electrification Pictured

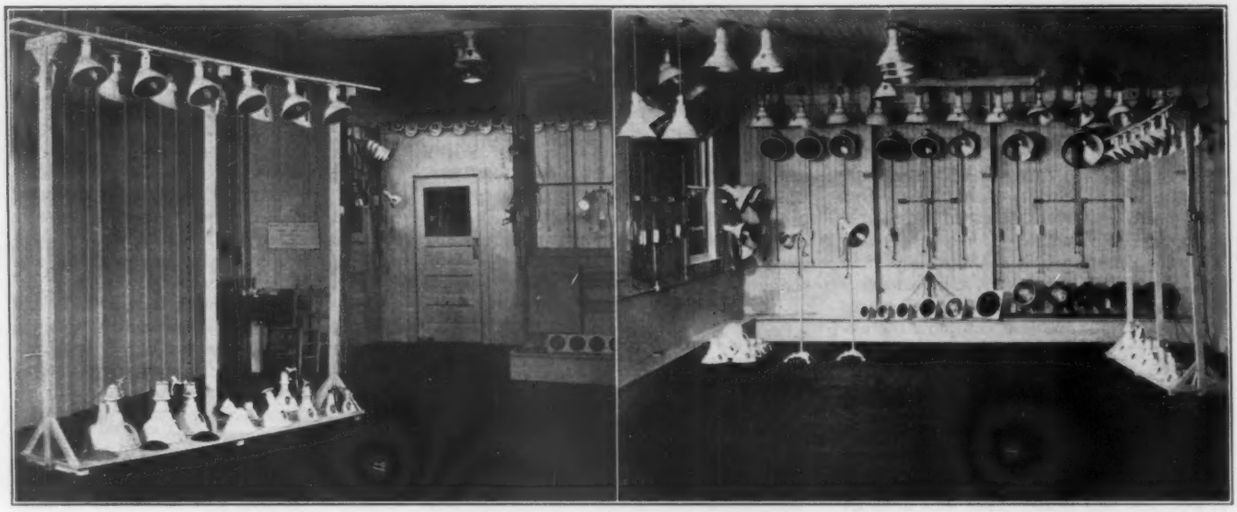
DEMONSTRATIONS of the possibilities for farm electrification featured the Puget Sound Power & Light Company's exhibit at Puyallup. (1) The complete electric home in one corner of the exhibit. (2) Electricity on the chicken ranch. (3) Pumping equipment for irrigation. (4) Small motor uses, such as for ensilage cutting, etc. (5) A view of the entire exhibit ending up with the electric home. This exhibit is a permanent feature of every fair held at Puyallup each year.











Complete display of lighting equipment arranged in sections, each section containing all types of reflectors of a given wattage. The window unit moveable rack may be seen in the left-hand picture.

Showing Prospects Lighting Units by Actual Test

Unique Showroom of Manufacturer So Arranged That Every Type of Reflector in Every Wattage May Be Demonstrated to Advantage

BILL WUELKER is a showman. Many years' experience as theater electrician, employing the art of lighting to bring out effects and to display actors to best advantage are reflected in the novel showroom he has designed and equipped on Franklin Street in San Francisco.

As the inventor of a finish for the inside of aluminum reflectors, Mr. Wuelker began manufacturing in San Francisco about two years ago. He adopted for his trade mark a baby white kitten and he and his wife started an intensive direct-by-mail campaign which has established a business and created a demand for a showroom for his equipment.

Showmanship plays an important part in selling. An old time showman employs his arts in the display of his merchandise.

The reflectors he manufactures range from reflectors for lamps of wattages from 10 to 1,000 watts. The room was divided into sections, each section to contain a complete exhibit of all reflectors for that particular wattage lamp. Cords with convenience plugs to which labels are attached are provided by which each reflector in the entire room may be demonstrated individually.

One of the novel features of the showroom is a display rack for the window lighting units. The rack is made of wood and is supplied with castors so that it may be moved to any position in the room.

If the prospect's window is said to be 8 ft. deep the rack is moved 8 ft. from a wall and the plug is connected and an actual demonstration of the amount of light which can be produced from the series of units can be given immediately.

How Shall the Retailer Use Direct-Mail?

Actual Campaign Mapped Out Along Lines Found Successful in Other Retail Selling Campaigns and Now Used Regularly

By JEAN BLUM*, Manager, Blum's Advertising Agency, San Francisco

HOW is the retailer to use direct-mail?

The most effective way is by mailing letters and other material bearing upon the product he sells to a list of his customers and prospects. Such material, if furnished by a manufacturer who allows the dealer to vary his message on the letter portion of an illustrated four-page letter, is usually the most desirable.

In the absence of such material a dealer can prepare either letters, post cards or folders and mail to a list of his customers and prospects immediately after publication of the advertising has taken place, thus tying in his store with the effect of the advertisements published.

He can print ordinary government postal cards briefly describing the advertised article, and inviting his customers to examine it at his place of business.

The Handbill as a Salesman

If he is a new dealer and has not yet learned the value of building a mailing list of his customers and prospects, he can print a folder or broadside and have it distributed from house to house within a certain radius of his place of business.

Incidentally, very few retail electrical dealers appreciate the many advantages and economies of this form of sales promotion. House-to-house distributing, properly done, reaches the best type of prospect—the housewife—who is the ultimate buyer.

I know that I am digressing from the subject of the use of direct-mail in electrical advertising—but since direct-mail is nothing more nor less than di-

* Last installment (see Electrical West, March, 1927, p. 163; April, 1927, p. 228) of address given before the Advertising-Publicity Section, Pacific Coast Electrical Association, San Francisco, Sept. 10, 1926.

rect selling, the subject of intensifying sales is always in order.

How I Would Sell Washers

If I were a retail electrical supply dealer and had a number of washing machines to sell, I would plan a campaign something along the following order:

1. I would put a lot of effort into securing a list of homes in my immediate trading area which are known not to have an electric washing machine.

2. Next I would prepare a series of one-cent government postal cards, consisting of at least 6 pieces, and mail them at intervals of from two to three days apart, always aiming to have them reach on a **Monday** and **Friday.** There is a psychological reason for choosing these days which should not be overlooked.

3. In that series I would stress the point of economy, time-saving, cleanliness, spare hours for other work, and above all else, simplicity of operation and ease with which a washer can be purchased.

4. My last card would consist of a double government postal reply card, with the name of the prospect already signed to it, asking for specific price and term information.

5. I would have my best salesman follow up any inquiries so received, wait about two weeks after the last card had been mailed, and then send out a letter reading something like this:

DEAR MADAM:

Here is a bit of interesting news which I know you will appreciate. The Blank Manufacturing Company, at our request, has given us permission to install the .....electric washing machine in 25 new homes, for advertising and demonstrating purposes.

There are no obligations connected with the offer, excepting that of testing out the machine in the privacy of your own home to see what it will do. After ten days our men will call and pick it up. If it does all we claim for it—and more—you may retain it on special terms that are both unusual and convenient. If you do not desire to keep the machine, you will be under no further obligations whatever.

There are only 25 machines that can be spared during the next week. All you have to do to take advantage of this unusual factory offer is mail the attached acceptance card.

Rest assured, Madam, that there are no obligations entailed. It will be a pleasure for us to know that you have been one of the first to take advantage of this offer.

Respectfully yours,

.....

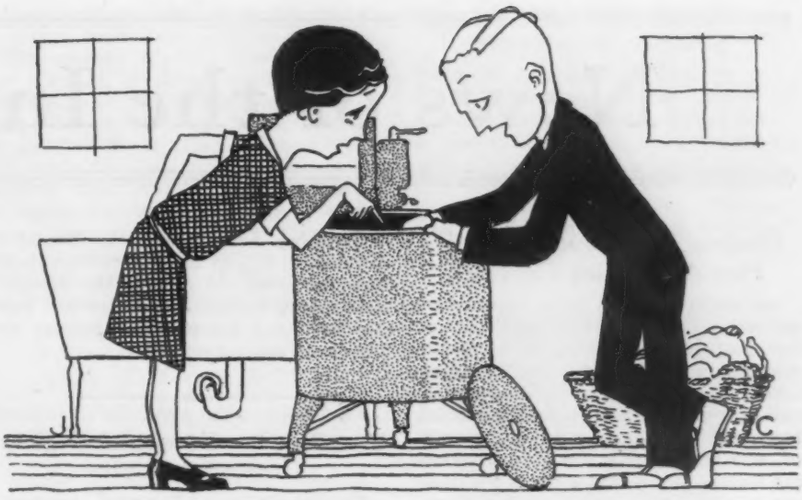
The letter of course may be varied in its contents. But the effect will prove quite apparent.

Three months later, conditions permitting, I would send out another letter, this time of quite a different character. In it I would say that the factory had unexpectedly shipped 20 more machines than space would permit and for that reason I was offering to sell a limited number of them at NO FIRST PAYMENT, just to move them.

After having combed the field by mail, I would employ an outside salesman to make a personal call upon every name on my list.

Proof of the Pudding

Now I expect quite a few of you may be a little skeptical of such selling tactics.



"I would have my BEST salesman follow up any inquiries so received."

For this reason let me give you some intimate figures on credits which have a direct bearing.

Some ten years ago a client of ours doing a credit or installment business faced a considerable overstock of goods at the end of the season. Sales were not always practicable in this retailer's case so I advanced the suggestion that a letter be sent to every customer offering to sell him any goods in the store without making a first payment.

The letter produced sales far in excess of all expectations. The "no first payment" feature has now become a semi-annual event in this store and many other firms have since adopted this method.

Four years ago I suggested this method to a furniture store client. The credit manager was very skeptical and feared that the payment would spread over too long a period.

Here is what actually happened. An expected quota of $20,000 increased sales for that month was set up. The offer was published in the local newspapers and circulated to lists of customers and prospects by mail.

Within two weeks the increase in sales reached $58,000. The percentage of those that came in to take advantage of the "no down payment" offer was very nominal. Sixty-eight per cent of those who came in actually made a first payment in excess of the usual amount. Twenty-five per cent came in within a week instead of a month to make the initial payment. The remaining 8 per cent definitely stayed by the offer.

What happened a year later? An analysis of all the accounts which had taken advantage of the offer disclosed that full payment was completed in an average of 10½ months, against the former average of 12 months. This particular firm has adopted this method of intensifying sales every year, selecting as the proper time for this offer the poorest selling period of the year. You all know how many other retail furniture stores now are featuring this method of selling.

Now let us get back to the subject of the use of direct-mail in electrical advertising.

Cuts Down Sales Resistance

One point I failed to cover is that direct-mail is a powerful aid to your sales organization.

Direct-mail which precedes your salesman's personal call effectively cuts down sales-resistance and acquaints your prospect with your product. In tests made by many large advertisers it was found that direct-mail increases results from personal salesmanship from 20 per cent to as high as 80 per cent.

One large firm recently made a test in order to determine the value of direct-mail as related to personal calls. Two equally good sections were selected and divided into four salesmen each. One was supported by a five-piece mailing campaign prior to the salesmen's calls. The other was unsupported.

The results of this test were amazing. The four sales-people who had the support of direct-mail produced 92 per cent more sales than the next division. The actual cost of the direct-mail support was but 1¼ per cent greater than the division which had to rely upon "cold" salesmanship.

At Least Five—

"No less than five, and better six, mailing pieces should be used," said Mr. Blum during the discussion which followed his talk. "You will get twice as many replies following your fifth mailing as you received for the four preceding altogether and more yet from the sixth. Most mailing campaigns fail because they are not carried beyond two or three mailings.

News of the Industry

Electric Refrigeration Trades Plan Advertising Campaign

An ambitious plan for a co-operative advertising campaign on refrigeration has been planned by the Electric Refrigeration Trades Association of Portland. The plan proposes drawing together every interest in the city which has anything to do with selling any sort of refrigeration to the public. Thus are included ice manufacturers and dealers in ordinary ice refrigerator boxes, as well as those selling electric refrigerators. All these interests are to advertise simultaneously during one week early in May using the same copy, which will carry the general idea to the people that refrigeration is desirable and necessary.

Principal media for the carrying of this general message are street cars, space on 450 having been donated by the Portland Electric Power Company, truck banners to be placed on all transportation units of all the firms entering the campaign, and large posters for display in stores and windows of the subscribing firms. In addition each entrant is encouraged to run additional newspaper advertising carrying the general copy to tie in with the campaign, and also carrying specialized copy pertaining to the particular product sold by that firm, whether it be ice or refrigerators or mechanical refrigeration.

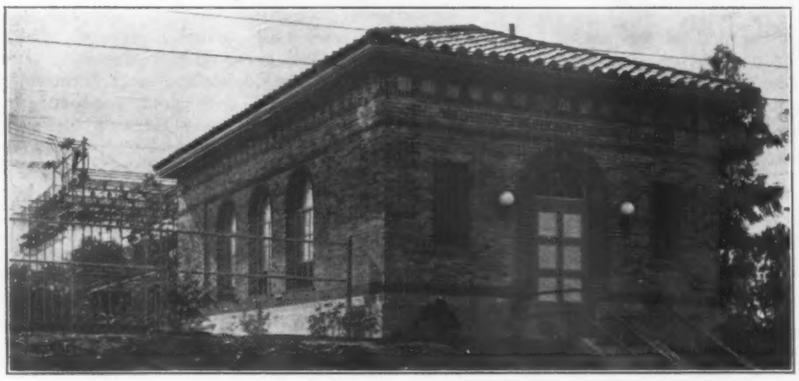
Entering firms are to be assessed from $5 to $15, in accordance with their size, to cover the cost of the general advertising material, and also will pay for as many banners and posters as they can use conveniently.

Two Tandem-Compound Engines Ordered by Utility

Two 94,000-kw., 1,500-r.p.m. tandem-compound turbine-generators are being built by the General Electric Company for the Southern California Edison Company. Each unit consists of a 90,000-kw., 100,000-kva., 16.5-kv. main generator, a 4,000-kw. auxiliary generator, and the 94,000-kw. tandem-compound turbine. The main generators exceed in both capacity and physical dimensions any electric generator previously built, according to the General Electric Company's announcement, and the turbines are also the largest of the tandem-compound type so far constructed. Each turbine-generator will measure 103 ft. in length and will weigh about 1,650,000 lb.

Other features of these machines include provision for future gas-cooling of the generators, and the combination of a double-flow low-pressure end with four vertical condensers. They will be the first of their type to generate current at 16.5 kv.

New Substation at Redlands, Calif.



Redlands substation of the Southern California Edison Company recently completed and placed in operation. The structure is 20 x 40 ft. in dimension and made of tan-colored brick. Electrical equipment consists of seven sections of 30-kv. steel rack, six sections 11-kv. rack, three 500-kva. transformers 30/11 kv., three 500-kva. transformers 30/4 kv., one 85-amp. 11-kv. regulator, two 100-amp. 4-kv. regulators, meters and relays for all lines, and one street light circuit. Included in the installation is an operator's cottage and combination garage. Cost of the entire installation was approximately $125,000.

Oakland Steam-Electric Plant Capacity to Be Increased

Extensive additions to the steam-electric plant of the Pacific Gas and Electric Company at First and Grove Streets, Oakland, Calif., involving an expenditure of $2,750,000, have been approved, and work is to be started immediately, according to announcement of L. H. Newbert, division manager. Plans include the removal of a 12,000-hp. turbine and eight 750-hp. boilers to be replaced with two 3,400-hp. boilers and a 47,000-hp. high-pressure steam-electric turbine with necessary auxiliaries, giving the plant an installed capacity of 71,500 hp.

The height from the ground line to the top of the boilers will be more than 60 ft., according to Mr. Newbert, while the auxiliary to be located over the boilers will necessitate a building more than 100 ft. high, the total height being approximately that of an eight-story building. The furnace walls in the boilers will be water-cooled. Tubes which are a part of the boiler will be located in the furnace walls to protect the brickwork from excessive heat. Salt water will be used for cooling purposes and will be pumped from the Oakland estuary and returned to it at the rate of 60,000 gal. per min. when the unit is operating at full load.

Pennsylvania University Offers Fuel Engineering Course

A one-year graduate course in fuel engineering leading to the degree of Master of Science in Fuel Engineering has been announced for the academic year beginning Sept. 30, 1927, by Prof. Robert H. Fernald, director of the Mechanical Engineering Department, Towne Scientific School, University of Pennsylvania.

The course will be highly practical, with a corps of nationally known authorities on the several subjects included in the curriculum augmenting the regular staff of the department. Included in the subjects to be studied are: fuel resources, mining methods, preparation for market, distribution, storage and rehandling, composition and combustion of fuels, manufacture of special fuels, uses of fuels and specifications for purchase, furnaces, fuel sampling, analysis and calorimetry, fuel testing, domestic heating and cooking, smoke elimination and regulations affecting the use of water power and of fuel resources. There also will be some research and field study. Information regarding the course may be had upon application to Professor Fernald or Dean John Frazer of the Towne Scientific School.

Power Sales Engineer Is Made City Sales Manager

Harry N. Carroll, for four years field engineer in the power sales department of the San Joaquin Light & Power Corporation, Fresno, has been transferred to the Great Western Power Company of California in the capacity of city sales manager of the San Francisco division. In his new position he has direction of all commercial and domestic

HARRY N. CARROLL

power sales activities of the Great Western company in its San Francisco district and is assisted at present by a staff of eleven salesmen.

Mr. Carroll received his training in the School of Mines at Rolla, Mo., and before joining the San Joaquin organization had several years experience in various fields, including oil production and shipping, agriculture and manufacturing. He is a student of agricultural economics and it is to his efforts that a large part of the San Joaquin company's agricultural power service is credited. Because of his close association with the agricultural industry he is considered an authority on crop economics and his reports on crop conditions and production in the San Joaquin Valley have been widely used. Mr. Carroll in the past four years also has been active in the electrification of oil fields in the southern San Joaquin Valley.

Request for License on Completed Plant Causes New Ruling

No appication for a license, under Section 23 of the Water Power Act, for a constructed project will be entertained by the Federal Power Commission unless the applicant holds rights of such character that it may continue its project without securing a federal license. This ruling of the commission's chief counsel has been approved by the commission. Where Section 23 does not apply it is possible for the commissoin to proceed under Section 4 of the Act, the law officer ruled, which means that the fair value of the project as of the date of the license is not applicable as it is in cases under Section 23. Section 4 provides that the net investment must be determined under the provisions of the statute on the basis of actual, legitimate, original cost.

The opinion of the chief counsel was given on questions arising out of the application of the Southern California Edison Company for a license for its Tule River plant. It was held that while the Edison company is not entitled, with respect to that plant, to apply for and receive a license under the provisions of Section 23, the commission may issue it a license under the provisions of Section 4 of the Federal Water Power Act.

Special Advisers on Colorado River Project Appointed

Senator Charles W. Waterman of Colorado; James R. Garfield, former Secretary of the Interior; Gov. Frank C. Emerson of Wyoming; James G. Scrugham, former governor of Nevada, and William F. Durand, professor of mechanical engineering, Stanford University, invited by Hubert Work, Secretary of the Interior, to act as members of a fact-finding commission to clarify the Colorado River situation and expedite legislation relative to the proposed Boulder Canyon dam project, have been appointed officially by the Department of the Interior as "advisers to the Secretary." The department made clear that these advisers are appointed in their individual capacity and not as a board or commission, an act passed by Congress in 1909 prohibiting the appointment of boards or commissions except by specific authority of Congress.

The five advisers were requested to meet Secretary Work and Dr. Elwood Mead, of the U.S. Reclamation Service, in California upon their return from Hawaii and proceed to the Boulder dam site. Senator Hiram Johnson and Representative Phil D. Swing of California also have been invited to be present at the conference.

The purpose of the meeting was set down in the letter of invitation as follows:

It is expected that the commission will survey cursorily the levees and delta country of the Lower Colorado, view the Boulder, Glen Ferry and Topoc dam sites, and any other points of interest on the river the commission may select.

It appears to me that this general survey of the physical features of the two basins will be necessary for an intelligent meeting of minds and will simplify a study of the data already collected, which will be submitted to the commission.

What is desired in a report which I can submit to Congress immediately after it convenes covers the essential features set up in the Swing-Johnson Bill and in addition thereto the probabilities for reimbursement to the government for its anticipated expenditures in connection with this development.

The potential uses of the Colorado River, its menacing possibilities, the interstate and international rights to its use will form, I presume, the important features of your study and report.

General Electric Company Elects Californian as Director

Henry M. Robinson, president of the First National Bank of Los Angeles, has been elected a director of the General Electric Company. He is the first Pacific Coast member of that board. Mr. Robinson, together with Owen D. Young and Vice-president Dawes, served on the committee appointed by the Reparations Commission which

HENRY M. ROBINSON

brought into existence the Dawes Plan of handling the reparation payments of Germany.

In addition to presiding over the affairs of the First National and the Pacific Southwest banking groups, Mr. Robinson is a director in the Southern California Edison Company, the Union Oil Company, the Pacific Mutual Life Insurance Company and the Federal Reserve Bank branch in Los Angeles. He recently was made a member of the board of directors of the Dodge Brothers Motor Company.

California Territory Divided between I.E.S. Chapters

Recently granted a charter as a section, the Los Angeles chapter of the Illuminating Engineering Society has made arrangement with the San Francisco Bay Cities Chapter for a division of the territory embraced by each section.

It has been agreed that the territorial division will be based upon the territories served by power companies. The southern division will comprise the territory served by the Southern California Edison Company, California - Nevada Power Company and San Diego Consolidated Gas & Electric Company. The San Francisco Bay Cities Chapter will comprise the territory covered by the remainder of the power companies of the state.

Electrical League of Utah Removes Offices.—The Electrical League of Utah, Salt Lake City, announces the removal of its offices from the Kearns Building to Rooms F and G, mezzanine floor, Newhouse Hotel. Mail address is P.O. Box 567.

Pasadena Light Department to Add 15,000-kw. Steam Unit

Plans and specifications for a new 15,000-kw. steam unit to be added to the present plant of the Municipal Light Department, Pasadena, Calif., have been ordered by the board of city directors. Several months ago Benjamin F. De Lanty, manager of the department, urged the necessity of constructing a new unit to bring the total plant capacity to 28,000 kw., and the action of the board grew out of that recommendation. It is desirable, according to Mr. De Lanty, to begin work as soon as possible in order to have the unit in operation in time to help care for the peak load in 1928.

This unit will cost approximately $612,000, according to present estimates. It is proposed to provide only one boiler at the plant at this time; the second boiler for standby purposes may be added at a later date.

Two Western Men Are Awarded Insull Medals for Successful Resuscitation

The names of two other Western men have been added to the list of those who have been awarded Insull Medals for successful resuscitation from electric shock by the use of the Schaefer prone-pressure method. These men are K. P. Sims, a lineman in the employ of the Mountain States Power Company, Albany, Ore., and Rodney Brown, a lineman of the Imperial Valley construction department of the Southern Sierras Power Company, Riverside, Calif.

The accident occasioning the resuscitation for which Mr. Sims was awarded the medal occurred on a 2,300-volt line of the Mountain States company near Stayton, Ore., last summer. R. E. Russell, lineman, while tying in the line on which the copper had been replaced, had fallen across two of the line wires, had been shocked unconscious, and was hanging by his safety belt. Mr. Sims, from the ground, had seen him immediately after this occurrence, had climbed the pole, cut Mr. Russell loose, lowering him to the ground by a hand line, and immediately had started to use the Schaefer prone-pressure method of resuscitation. Breathing was restored in about ten minutes.

K. P. Sims (left) being presented with the Insull Medal by J. B. Fisken.

The presentation meeting in Albany which was attended by about 100 employees, friends of employees, and the general public, was presided over by Z. E. Merrill, assistant general manager of

Rodney Brown, an Insull medalist of California.

the company. As the appointee of Mr. Insull, J. B. Fisken, consulting engineer, The Washington Water Power Company, Spokane, who is a member of the accident prevention committee, Engineering National Section, N.E.L.A., and also chairman of that committee in the Northwest Geographic Division, made the presentation after an address on the economy of safety work in industry.

In presenting the Insull Medal to Mr. Brown at the afternoon session of the first day of the annual meeting of the Southern Sierras Power Company, the Nevada-California Power Company, the Imperial Ice & Development Company, interstate Telegraph Company and associated organizations at Riverside, E. B. Criddle, vice-president and general agent, the Southern Sierras company, gave the following description of the accident and the resuscitation:

On Oct. 11, 1926, at 3:30 p.m., G. D. Whitney, employed as lineman in the Imperial Valley, while working on a steel tower removing a current transformer with a set of blocks, accidentally came in contact with a 15,000-volt wire, falling from the structure to the ground. There were no signs of life. Assisted by C. H. Johnston, Sam Magee and Frank Lucking, Rodney Brown, a lineman working on the same crew, at once applied the Schaefer prone-pressure method of resuscitation. No signs of life were apparent for five or six minutes, but life was finally restored.

Number of Outlets Increased by Colorado League's Work

A total of 2,003 calls on or contacts with architects, builders, electrical interests, home owners and others was made by the staff of the Electrical League of Colorado, formerly the Electrical Co-operative League, during the past fiscal year. As a result of this field work and related activities, 7,365 outlets were added to electrical installations previously planned, according to the report of the league's work just published by the advisory board. Of that number 5,774 have been installed on 195 completed jobs, the remainder covering additions to work contracted for or actually under construction but not completed at the close of the year.

Through the contacts made, backed by the confidence previously established in the league, 224 sets of building plans were received for checking of original wiring and lighting layouts. Of this number nearly 50 per cent concerned residential and apartment construction and the rest were of a commercial or industrial nature.

Due to conflicting activities and changes in staff personnel progress on the Red Seal Plan was delayed until August, 1926, when a preliminary advertising campaign was launched. At the close of the year 50 signed Red Seal applications were on file, of which 29 installations were actually completed and certificates issued. The first Red Seal home, which was Denver's fourth official electrical home, was opened to the public in May and was visited by 5,317 adults during the 8-day exhibition.

Christmas campaigns to stimulate the giving of electrical appliances and the Outdoor Lighting Contest were sponsored by the league with gratifying success.

Plans for the coming year, as outlined by the report, include continuance of all of the major activities of the league with emphasis on business building operations; conducting another electrical home exhibition; fostering an outdoor Christmas lighting contest; rendering window trimming service to dealers; carrying out a comprehensive Red Seal program; and renewed educational effort, including the making of further contacts with architects, builders, home owners and electrical contractors, and the giving of "better lighting" talks and demonstrations before civic and commercial associations and educational bodies as in the past.

Voters of Oroville, Calif., Defeat Proposition to Buy Electric Distribution System.—At a special election called March 24 the voters of Oroville, Calif., defeated the proposition to float a $150,000 bond issue for the purpose of purchasing the electric distribution system of the Pacific Gas and Electric Company within the municipal limits. The vote stood 649 against and 397 for the proposal.

Many Subjects Discussed at Two-Day Joint Conference at Colorado Springs

The second annual committee conference of the Rocky Mountain Division, N.E.L.A., and Colorado Public Service Association, was held at the Broadmoor Hotel, Colorado Springs, March 21-22, with a total registration amounting to approximately seventy-five, three states being represented.

Arthur Prager, president, Rocky Mountain Division, N.E.L.A., and manager of the Albuquerque Gas & Electric Company, served as general chairman during the forenoon sessions on Monday. He spoke on the value of effective committee work.

G. B. Buck, chairman of the commercial section, and manager of the commercial department, electrical division, Public Service Company of Colorado, emphasized the importance of intensive commercial activities for utilities, and stated that there is great need for an entirely different selling attitude on the part of the central stations.

P. D. Shepperd, chairman of the customer relations committee, and manager of the Colorado Central Power Company's Fort Lupton office, cited specific instances tending to show that central-station commercial-department activities can improve or destroy customer relations.

H. H. Kerr, superintendent, electrical department, Public Service Company of Colorado, speaking on electric ranges and refrigeration, brought out that there are great potential possibilities in the Mountain States territory for increased load and improved customer relations through intelligently conducted range campaigns.

J. F. Greenawalt, president of the Colorado Public Service Association, and director of publicity, Mountain States Telephone & Telegraph Company, Denver, served as general chairman during the afternoon sessions. In his opening address, "The Larger Opportunity of a State Association," Mr. Greenawalt stressed the necessity of utility executives becoming informed relative to the activities of central-station business outside of their own territories, as a matter of protection to themselves against adverse public legislation and general business stagnation. George Spaulding, tax commissioner of the Mountain States Telephone & Telegraph Company, presented a paper on "Utility Taxation Problems."

G. E. Lewis, executive manager, Rocky Mountain Committee on Public Utility Information, Denver, discussing the subject, "Informing the Public," explained that the committee's booklet, "A Glimpse of the Public Utility Industry," the condensed story of utility business, had been made available to all member companies in order that they could distribute the booklets to all high schools and colleges in their territories.

The work of the association's legislative committee was explained by H. S. Sands, manager of the industrial division, Westinghouse Electric & Manufacturing Company.

Tuesday morning's session opened with an announcement by H. H. Kerr that the Rocky Mountain Division power survey will get under way in the very near future.

J. A. Clay quoted from reports on rural electric service in various parts of the country, which indicated that there is a growing demand for such service. H. H. Kerr recommended that central stations get together in the matter of rural extensions, in an effort to work out problems of standardization that would be mutually beneficial.

The electric range situation was discussed by L. R. Storey, who declared that a proper rate structure for range consumption would answer many demands for rate reductions and combat municipal ownership.

O. A. Weller, secretary, Rocky Mountain Division, N.E.L.A., then spoke on the subject, "Association Relationships," stating that the state utility associations activities are not as co-ordinated as they might be for the good of the industry. At this point a resolution was read asking that a committee be appointed to consider the feasibility of linking together the utility associations of Colorado, Wyoming and New Mexico, this committee of seven men to draft a set of by-laws or constitution and to report their recommendations at the next meeting in October if the formation of such a tri-state association be found advisable.

F. A. Tewksbury, manager, claim department, Public Service Company of Colorado, gave a brief description of the work done by the first-aid teams organized in the company under his supervision.

Industrial relations was the subject discussed by Clare N. Stannard, who urged that utility executives give even more consideration to the interests of their employees, and, by frankness and openness, strive to win their loyalty and devotion.

E. F. Stone then took up the matter of customer-ownership of utilities, and credited the national committee with having furnished the local association with much helpful information. Discussion was led by J. E. Loiseau, who spoke on the two methods of handling stock-selling campaigns.

The joint annual convention, Colorado Public Service Association and Rocky Mountain Division, N.E.L.A., to be held at Colorado Springs Oct. 17-20, was referred to by W. C. Sterne, president-elect, Colorado Public Service Association, and convention committee appointments were made.

Accounting section activities were taken up by W. J. Benning, chairman of the section, and chief accountant, Southern Colorado Power Company, Pueblo.

Economical Long-Distance Power Transmission Solved

A patent recently granted Frank G. Baum, San Francisco engineer, and assigned to the Westinghouse Electric & Manufacturing Company, covers an invention which solves the problem of economically transmitting large amounts of electric power over distances of several hundred miles, according to officials of the Westinghouse company.

"Mr. Baum's invention eliminates one of the difficulties that has seriously embarrassed electrical engineers during the extensive superpower developments which have been taking place during the past few years," stated W. S. Rugg, vice-president in charge of engineering of the Westinghouse company. "It has been known for a long time that long transmission lines differ from short lines in many respects. For example, it is entirely feasible to transmit large amounts of power over a simple set of wires for distances of 100 miles or so, but were the attempt to be made to do the same thing over a line 500 miles long, it is known that, due to the surges that would pass back and forth over such a line, the voltage conditions would become so erratic that the line would become inoperative.

"Effects of this sort can be controlled to a certain extent by means familiar to all electrical engineers, but Mr. Baum's invention provides a method that is far more efficacious in imparting stability to long transmission lines than anything so far known. By means of it, the capacity of a given long line can be increased 75 per cent, according to present estimates, at a cost not exceeding 20 per cent of the original cost of the line."

Mr. Baum describes his invention in the following words:

My invention covers the connection of a plurality of automatically regulated synchronous condensers at substantially uniformly spaced points, directly to the high-voltage transmission line. The practical effect of such a procedure is to transform the long line into a series of relatively short lines, in each of which the factors that cause instability can be readily controlled.

By dividing the transmission line into relatively short sections, say 100-mile lengths, and supplying a corrective current such as a charging current under light-load conditions, to the line from a synchronous condenser located at each of such points, a stubstantially constant potential is maintained throughout the length of the line, and power may be supplied or received at any of these points, while requiring only a minimum of additional generating or distributing apparatus.

In case the line is supplying a load at an intermediate point, as well as at its terminal, if the load at the intermediate point were suddenly thrown off, the synchronous condenser at the intermediate point would still be over-excited for the voltage formerly existing. However, the voltage at this point would not undergo any substantial rise in value, since the synchronous condensers in the aforesaid sections would become under-excited upon the occurrence of a relatively small increase in voltage, and they would thus inherently and immediately act as stabilizers to hold the potential down at those points, so that the limit to which the potential could rise at the load point in question would be the possible rise corresponding to only 100 miles of open-end transmission, which is a relatively small amount.

It will be seen that this stabilizing effect occurs irrespective of the total length of the transmission line, since the individual sections inherently act in the manner set forth, regardless of the distance from any generating station.

News Briefs

Transmission Association Offers Prize for Slogan Emblem.—The Power Transmission Association, with offices in the Drexel Building, Philadelphia, announces it will make an award of $250 to be announced at the National Industrial Advertisers Association convention in Cleveland, June 15, 1927, for the best slogan emblem design for the association which is received on or before June 5, 1927. The American Society of Mechanical Engineers has been asked to name a committee of three to select the person or persons whose ideas are entitled to the award. The wording should typify the objective of the association in briefest possible words, with a striking action design, showing some application of or relating to mechanical power transmission.

San Diego, Calif., Seeks Colorado River Water.—Application has been filed by the City of San Diego with the California Division of Water Rights for permission to divert 155 sec-ft. of water from the Colorado River for power purposes, 18,580 theoretical horsepower to be developed. The city proposes to build a 180-mile aqueduct to convey the water to its confines for domestic supply and the power generated is to be distributed within its own limits and adjacent territory. The application for 155 sec-ft. for water supply was filed a year ago.

Yosemite Power Company Granted Water Rights.—The California Division of Water Rights has issued permit to the Yosemite Power Company, San Francisco, to appropriate 175 sec-ft. and 65,000 acre-ft. of water from the South and Middle Forks of the Tuolumne River for power purposes, 66,303 theoretical horsepower to be developed. Estimated cost is set at $5,500,000.

Additional Territory Added to Denver District of Westinghouse Company.—The Denver district office of the Westinghouse Electric & Manufacturing Company now handles the company's business in New Mexico and in a portion of Texas, and the El Paso office has become a branch of the Denver office.

California Farmer Awarded $20,000 for Riparian Rights by Jury.—Morton R. Crum, a farmer, has been awarded $20,000 by a jury at Redding, Calif., as damages against the Pacific Gas and Electric Company for depriving him of riparian rights along the Fall River. Mr. Crum had sued for $43,000. The case is viewed as a forerunner of suits by other residents of the district against the company totaling $800,000.

New Firm of Marketing Counsellors Organized.—Announcement is made of the organization of Goodwin, Nicholas & Morton, with offices at 522 Fifth Avenue, New York, to render service as marketing counsellors in the electrical and allied industries. The offices of the corporation are: president—William L. Goodwin, formerly operating vice-president of The Society for Electrical Development; vice-president and treasurer—Frederic Nicholas, formerly general secretary of the Associated Manufacturers of Electrical Supplies and executive secretary of the Electrical Manufacturers Council; and vice-president and secretary—Walter H. Morton, formerly treasurer of the Sanborn Electric Company, Indianapolis.

Public Service Company Plans Improvements in Sterling, Colo.—With the securing of a renewal franchise in Sterling, Colo., the Public Service Company of Colorado has announced an expansion program over a period of two or three years involving the expenditure of a million dollars in improvements to the company's plant and distribution lines in that community. The new franchise provides a fixed charge per kilowatt-hour in place of the "room rate" system previously in force. More than a 10 per cent saving to the consumers will result, it is stated.

Coast Valleys Company to Occupy New Quarters at Salinas, Calif.—In the very near future the Coast Valleys Gas & Electric Company's office at Salinas, Calif., will occupy the building which now is being remodeled for that purpose, according to Co-Val Booster. The main floor will have an appliance sales department, together with customers' application and payment counter, commercial department, investment department, customers' billing department and stationary storeroom. On the second floor will be the offices of the vice-president and general manager, general superintendent and engineering department, auditor and accounting department, and purchasing agent.

Utility's Franchise Renewed in La Junta, Colo.—The city council of La Junta, Colo., has passed an ordinance granting the Southern Colorado Power Company a renewal franchise of ten years duration. La Junta is served from the company's plant located in Pueblo. In order that provision might be made for emergency power when service from Pueblo is impaired, a clause has been inserted in the contract permitting the city to obtain power from the Holly Sugar Company's generating plant at Swink, Colo.

Northwest Electric Light & Power Association

Attractive Plans Being Made for Northwest Convention

Program plans and arrangements for the entertainment of the large number of guests who are expected to attend the annual convention of the Northwest

P. M. PARRY

Electric Light and Power Association, to be held in Salt Lake City June 21-24, rapidly are assuming definite shape.

It has been decided to hold one general session each day, at which all can be present, and each of these sessions will continue until the business of each particular section is completed. All sessions will be held at the Hotel Utah.

The opening session on Tuesday morning will be devoted to reports by the officers and the president's address. On Wednesday morning will be a general meeting devoted entirely to the Commercial Section. This will include a general review of the activities of that section, by George C. Sawyer, chairman. Three additional speakers will discuss specific problems of the commercial section, and there will also be an address by J. E. Davidson, chairman of the Commercial National Section.

The first half of Thursday morning's session will be conducted by the Accounting Section, at which W. L. Fitzpatrick, of the Mountain States Power Company, of Tacoma, will preside. The second half of this session will be devoted to the Engineering Section, presided over by O. L. LeFever, of the Northwestern Electric Company, Portland. On Friday morning the first half of the session will be devoted to the Public Relations section. R. M. Boykin, of the Puget Sound Power & Light Company of Seattle, will have charge of the first part of this session, and in addition to giving his own committee report, he will have a special report given by the chairman of the women's committee, and also reports of the various state vice-presidents. The other half of this session will be a general session at at which will be given the reports of

the various convention committees, and also will include the election of officers for the succeeding year, and the discussion of any matters of a general nature.

An attractive program of entertainment is being planned. Among the events scheduled are a trip to Bingham, Utah's famous mining camp, a golf tournament, a dinner dance on the roof garden of the Hotel Utah, and a special organ recital at the Mormon Tabernacle. Special plans for the entertainment of the ladies include teas, luncheons and sightseeing trips. The president's reception and ball will be held Tuesday evening.

P. M. Parry, commercial manager, Utah Power & Light Company, general chairman in charge of convention plans, announces that all members of his various committees are working enthusiastically to make the coming convention the best in the history of the organization.

Mr. Parry has been an active figure in the electrical industry in the Intermountain section for a number of years. He was born in Ogden, Utah, and recevied his education in the schools of that city. In 1904 he became associated with the Utah Light & Railway Company in Ogden, one of the predecessors of the Utah Power & Light Company, his first work with this institution being in the accounting department. In June, 1911, he became treasurer of the Merchants Light & Power Company of Ogden, also a predecessor of the Utah Power & Light Company. Later he was made manager of this company remaining in that capacity until 1912, when the Utah Power & Light Company was organized through the consolidation of a number of smaller institutions. Mr. Parry then was made manager of the Utah Power & Light Company's Ogden division and served in that position until March, 1919, when he became commercial manager of that company with headquarters at its general offices in Salt Lake City.

Accounting Section Discusses Many Topics at Meeting

Stores and purchasing, credit rating, statistics, customers' records and merchandise sales accounting were discussed at length by forty-five delegates to the general meeting of the Accounting Section, Northwest Electric Light & Power Association, held at Portland, March 21. The section chairman, W. L. Fitzpatrick, general auditor, Mountain States Power Company, Tacoma, presided.

First on the program was a paper on purchasing and storeroom accounting by I. D. Murfield, chief clerk stores accounting, Portland Electric Power Company, Portland, in which he outlined the perpetual inventory system, showing the principal advantage of that system to be in the check on material it provides so that a minimum of capital is tied up in stores and a minimum of obsolete material is accumulated.

A paper, read by B. E. Lee, division auditor, Mountain States Power Company, Albany, Ore., treated of the fundamental difference in the two elements of storekeeping, the accounting or financial, and the operating or physical, and showed how in a complete system the checks and balances operated to effect adequate control of material and to furnish valuable cost records for the guidance of executives.

In a general discussion of stock and stockkeeping, M. D. Field, secretary and general auditor, California Oregon Power Company, Medford, Ore., raised the question as to whether or not a list of obsolete material published by member companies would be of mutual value in effecting an exchange of such material between companies. It was pointed out that this had been tried in the Northwest geographic division but after a time had been abandoned as not worth the expense and trouble.

To Co-operate with N.E.L.A.

Reporting for the statistical methods committee, D. F. McCurrach, statistician and rate engineer, Northwestern Electric Company, Portland, chairman, stated that his committee would cooperate with the national committee in urging member companies to support the statistical department of the N.E.L.A. He displayed a copy of this department's questionnaire to be filled in by member companies, and showed that practically all the material requested was included in statistical material furnished in annual reports to commissions and other regulatory bodies so that no great amount of additional work will be required for this report. It was explained that the purpose of this report was to enable the N.E.L.A. to gather and assemble the essential statistics of the light and power industry so as to be in a position to present the facts of this industry, and to compile data constantly sought by various business, educational and scientific organizations.

The meeting then was opened for general discussion, and A. J. Johnstone, general auditor, Portland Electric Power Company, raised the question as to whether or not to charge retirement reserve with the salvage value of material now in stores, in the case of that material having been removed from property at some prior time, but because of an assumed usefulness not charged entirely to retirement reserve at that time. A difference of opinion developed as to whether the proper procedure might be through inventory adjustment as would have been the case had the material never been in property, but the weight of opinion seemed to favor the charge to retirement since this method would be in the nature of correcting an error in judgment in assigning a useful salvage value to the material at the time it was removed.

Opening the afternoon session, H. L. Walther, manager, Oregon Public Utiilty Information Bureau, Portland, outlined the plan of his bureau to gather statistics of the industry pertinent to the Northwest so as to make his office available as a clearing house for information to which could be referred many of the numerous requests received by individual companies. The plan is to use the same information as will be supplied to the N.E.L.A. statistical department with some additional information pertaining to the particular conditions in the Northwest.

Exchange of Credit Information

Describing the exchange of credit information system in use in the Pacific Coast Gas Association, F. L. Nagel, supervisor of credit department, Portland Gas & Coke Compnay, Portland, explained that this system has been effective in reducing bad debts and in making unnecessary in many cases the taking of the odious deposit. On receipt of an application for service from a stranger, the company asks where he formerly had utility service and then dispatches an inquiry to that company with space provided for a brief report on the former customer's credit record. On the contents of this report when it is received the sending company bases its demand for security from the applicant or allows him to continue his account unsecured. In addition, this system has been effective in assisting the companies to collect final bills.

R. H. Jones, assistant treasurer, Utah Power & Light Company, Salt Lake, chairman of the general records committee, reported that his committee was making a study of internal auditing for this year. Describing the internal auditing practices of his company, M. J. Wilkinson, assistant secretary and assistant treasurer, Pacific Power & Light Company, Portland, stated that both the field audit and the office audit were employed extensively as part of the accounting procedure of the company. He explained that the purpose of such auditing was as much to insure accurate records being produced as to detect or forestall defalcations.

A discussion on the use of machines for customer billing and accounting was opened by W. L. Fitzpatrick when he read a paper on the subject in which the stub plan and bill register plan of customer accounting by the use of machines were contrasted and the advantages and disadvantages of each outlined. Later discussion centered around the relative cost of the machine method as against the hand method and brought out the fact that the machine method was economical only when machines could be run approximately all the time. As a contrast to the question of cost, W. F. Miller, auditor, The Washington Water Power Company, read a paper in which he discussed the relationship of adequate customer accounting to the building of pubilc good will and showed why the public relations consideration should outweigh the attempt to reduce bookkeeping costs by a few cents per customer.

Appliance Sales Accounting

A spirited discussion of many phases of appliance sales accounting was started by a paper on this subject read by O. V. Johnson, Mountain States Power Company, Tacoma. The paper described a manner of accounting for merchandise sales departments which contemplated isolating such a department from the regular operating department with the idea of showing the exact earning from merchandise sales, taking into consideration the investment incident to the company's being in the merchandise business.

Closing the meeting, R. H. Jones, who is treasurer of the Northwest Electric Light & Power Association, told of tentative plans for the association convention in Salt Lake in June and invited all to attend. A plan is being worked out, he said, in which business sessions at the convention will be held only in the morning, leaving the afternoons free for recreation and sightseeing.

Interest in Lighting Schools Is Shown by Big Attendance

Characterized by one committeeman as the most successful meeting of the electrical fraternity in his city, and by another as one of the finest experiences of the industry in his locality, the lighting schools conducted in February in the Northwest received much commendation from all concerned. The schools were conducted in Portland, Seattle and Spokane by Clark Baker, National Lamp Works, Oakland, Calif., under the auspices of the lighting committee of the Commercial Section, Northwest Electric Light & Power Association. The committee in charge of arrangements for the school in Portland was headed by A. C. McMicken, general sales manager, Portland Electric Power Company; in Seattle, by R. W. Clark, sales manager central district, Puget Sound Power & Light Company; and in Spokane, by Lewis A. Lewis, sales manager, The Washington Water Power Company.

A week was allotted in each city for the presentation of five lessons, which covered elementary principles of illumination and were replete with practical problems in laying out adequate lighting for different kinds of businesses and different sizes of store spaces. One lesson was on window lighting and the use of colored lights. The course was intended primarily for estimators of contracting establishments, for fixture salesmen of the jobbers, and for central station lighting salesmen.

Believing that greater good could be accomplished by the schools if a large percentage of contractors and dealers could be interested in them, the committees endeavored to enroll the larger percentage of the quota for each city from among the members of this branch of the industry. An analysis of reports from the three cities indicates that this was accomplished, in that out of a total enrollment of 190, ninety-six were from the contractor group, forty-six from the jobbers, and forty-eight from the central stations. Due to the fact that the three cities in which the schools were held are widely separated geographically, it was possible to obtain a fairly widespread representation from the territory of the Northwest geographic division, particularly among the central-station enrollment. It is interesting to note that twenty cities and towns in Washington, five in Oregon, and three in Idaho were represented at the schools.

Percentage of attendance in each school was very high, indicating a considerable interest among those taking the course. Hope was expressed by many that some means of conducting a similar school annually could be worked out.

Pacific Coast Electrical Association

Arrangements for Convention Rapidly Being Completed

Under the efficient supervision of R. L. Cardiff, manager, Coast Counties Gas & Electric Company, Santa Cruz, who is general chairman of the Pacific Coast Electrical Association's annual convention to be held in that city June 14-17, arrangements for that event already are unusually complete.

The program committee, of which R. R. Cowles, of the engineering department of the Pacific Gas and Electric Company, San Francisco, is chairman, has planned four general morning sessions. Tuesday morning will be given over to the general business session; on Friday morning the session will be in charge of the Public Relations Section and will feature the work of the women's committee. At the sessions on Wednesday and Thursday mornings speakers will be provided by each of the sections to present to the entire attendance some aspect of the section's work in its relation to the industry as a whole. These speakers have been chosen from without the sections in order that the speaker's viewpoint may be that of an outsider. On Friday afternoon an "industry conference" open to the public will be held, at which the theme of the convention, "Progress Follows Light and Power," will be discussed by leaders in Pacific Coast affairs.

The parallel sessions of the different sections will be held on Tuesday and Wednesday in the afternoon. A golf tournament and sports are scheduled for Thursday afternoon. Details of the tournament will be in charge of C. T. Hutchinson, president, McGraw-Hill Company of California.

The entertainment features as planned by the committee are particularly attractive, and a number of novel ideas now are being worked out by Clark Baker, Sr., of the National Lamp Works, Oakland, chairman. The president's reception will be held Tuesday evening, and the banquet Friday evening. There will be no speakers upon the latter occasion, a spectacular lighting exhibit being planned as an innovation.

Reservation blanks and full details relative to attendance and reservation will be mailed to the entire membership of the association.

San Diego Lighting School Is of Much Benefit to Students

A course of study in illumination recently was presented in San Diego by the lighting committee, P.C.E.A., under the leadership of Clark Baker, Sr., chairman.

The enrollment totaled between forty and fifty students, the average attendance at the five classes being close to 100 per cent. Among those enrolled were seventeen contractors, nine jobbers' salesmen, the city inspector, several architects, and employees of the San Diego Consolidated Gas & Electric Company. Some of the sessions were attended by a score or more of visitors, including optometrists and others intimately concerned with the effects of correct or incorrect lighting. The subjects covered by the five lessons included: Lighting Practice and Terminology; Lighting Units and Lighting Calculations; Lighting Calculations; Lighting Calculations and Show Window and Color Lighting; Sign Lighting; General Review.

Circulation of Programs Is a Feature of Engineering Section Meeting

The regular spring conclave of the Engineering Section held in Fresno, April 6-8, inclusive, marked the close of the past year's activities and the opening of the next. Two features of particular interest and which enhanced the value of the programs of the various committees were the circulation of general session programs and also the circulation of detailed programs of the activities of each committee assigning a definite hour for each of the major discussions. These programs were mimeographed and inexpensive, but served

very well to enable delegates to follow in each of the committees the subjects in which they were the most interested.

A general luncheon held at noon of the second day provided an opportunity for all delegates to get together in one body for the social hour and to hear from each committee chairman the more important features of each committee's work. More than 150 attended the luncheon. Entertainment features provided comprised trips to adjacent stations including the new Balch plant of the San Joaquin Light & Power Corporation and the Big Creek plants of the Southern California Edison Company. The delegates were the guests of the San Joaquin Power Club at the club's dance held the evening of the last day. A most interesting motion picture film prepared by the San Joaquin Light & Power Corporation depicting the development of the San Joaquin Valley through the development of electricity was shown at one of the theaters and presented an evening's entertainment, along with other features of the show.

Activities within the various committees are covered best in the brief reports of committee chairmen that follow. Space permits only an outline covering the most important features considered by each committee.

Accident Prevention Committee

By M. S. SLAUGHTER

The Southern Sierras Power Company, Chairman

Small attendance at the sessions of the accident prevention committee restricted the broad value and application of the constructive work being done by the committee.

The most important papers included a discussion of accident prevention in construction work, a paper on uniform accident statistics, and a discussion of unusual accidents. The committee is doing constructive work along sensible and practical lines and is searching for every possible channel through which to make its efforts more useful and more widely considered.

Underground Systems Committee

By N. B. HINSON

Southern California Edison Company, Chairman

A motorcycle cart used by the Los Angeles Gas & Electric Corporation for cable splicers was described and discussed. The chairman gave a brief outline of his recent trip to the East wherein he investigated some of the new developments in underground construction. A discussion of the minutes of the Eastern meeting brought out the benefits to be derived from keeping in close touch with the work being done by the N.E.L.A. underground committee.

Subjects suggested for the study of the committee for the year 1927-28 include transformer and manhole covers, the design of which needs to be improved to care for an increasing loading and wear, and a study of the requirements of residential districts underground systems with the idea of cost reduction and standardization insofar as possible, and the possible joint use of duct lines.

Economies and safety to be obtained by the use of lead-covered cable on outdoor above-ground transformer installations aroused interest. Great interest was shown in the high-voltage cable installations under way in the East. In order that companies contemplating the installation of underground cables might profit by the experiences of other companies, the underground systems committee is the logical place for a full discussion and analysis of operating successes as well as operating difficulties of member companies.

Apparatus Committee

By H. A. LAIDLAW

Pacific Gas and Electric Company, Chairman

A report on oil circuit breakers outlined improvements carried out during the past year by various manufacturers and indicated the trend toward a more rugged construction and higher contact speed. A record of automatic reclosing breakers indicated a high percentage of successful reclosures and indicated an increasing adoption of this type of equipment. Detailed description of the application of several different methods of tap-changing and devices for use under load conditions were reported upon. This report also indicated a decided tendency toward the use of self-cooled transformers and described various methods that have been used to convert water-cooled transformers to self-cooled units.

Fire protection and fire prevention seems to be receiving less attention than warranted by its importance. A report on this subject indicated a decided lack of suitable fire protection for large machines among all member companies reporting. Several new types of relays, improvements in old types and new developments in application were presented and discussed together with data pertaining to the reliability of relay operation. General practices of Pacific Coast companies as regards the operation of various different types of equipment were outlined by one of the new sub-committees of the apparatus committee. Another report dealt with the general design of stations and station apparatus as developed by Pacific Coast companies.

Subjects recommended for the attention of the apparatus committee for the year 1927-28 were as follows: Oil circuit breakers, relays and supervisory control, operating methods and routine.

Hydraulic Power Committee

By J. M. GAYLORD

Southern California Edison Company, Chairman

Latest developments in high-head plant design as exemplified by the Balch and Big Creek 2-A installations were described to the committee. An interesting talk illustrated with lantern slides gave some information on modern practice in the design and construction of metal flumes. Lively discussion upon the subject of prevention of oil leakage from generator bearings indicated a general opinion that the mechanical problem involved is not appreciated by generator designers who usually are electrical men.

An increasing interest was manifested in the study of the reliability of hydroelectric units, for which study the 1926 tabulations were submitted. An analysis of Pacific Coast practice in dam designs also aroused interest.

In selecting subjects for next year's work the value of the hydraulic power committee as an agency for the distribution of information regarding current trends in design and operating practice was emphasized. The duty of reporting upon current practice and developments in the hydroelectric field was assigned to the vice-chairman. New subjects adopted included flumes, automatic plants, packings and stuffing boxes, and power-plant cranes.

Inductive Co-ordination Committee

By L. J. CORBETT

Pacific Gas and Electric Company, Chairman

Discussion of current cases of inductive co-ordination brought out the fact that railroad companies appear to be more concerned with parallels than formerly. Possible reasons were thought to be the adoption of repeater systems on the longer lines and also possibly some anxiety over automatic train-control system interference.

Radio interference procedure appears to be well in hand. The plan of the Pacific Radio Trade Association in San Francisco is working out in a satisfactory manner. The association's expert locates the source of a disturbance after the dealer has investigated the merits of the complaint. The reports indicate the usual difficulties encountered and also give the power companies rather a clean bill of health as far as radio disturbances are concerned. Expense of the association's activities is carried jointly by the radio dealers and the power companies.

In addition to the regular studies of current cases of inductive co-ordination, radio interference cases, and power company communication the committee expects to study the operating rules of various member companies as they pertain to General Order 52 of the Railroad Commission.

Meter Committee

By A. J. HALL

Ontario Power Company, Chairman

New meters presented and described by manufacturers' representatives constituted one of the interesting features of the committee's session. The new General Electric type I-16 watthour meter and a new Sangamo reactive kva. hour meter were exhibited. A joint subcommittee with the apparatus committee was recommended for the joint study of relays, relay operations and relay applications.

Final reports of sub-committees were considered and definite plans were laid for next year's work. The sub-committee on the education of metermen reported completion of a short course at the California Institute of Technology, Pasadena, at which 40 men were enrolled. A similar successful course at the University of Arizona, Tucson, was attended by 41. The coming meter short course at the University of California, Berkeley, was outlined.

Overhead Systems Committee

By C. E. YOUNG

Pacific Gas and Electric Company, Chairman

The first report covered the grounding of distribution circuits and the common-neutral system. It was the opinion of the power company representatives present that the use of such construction should not be prohibited by state regulations. A final report on the standardization of pin and insulator threads was presented and it was decided to transmit the data collected in the study to the national committee for further action. Under the subject of line switches and protective equipment, fuses and their rating received most attention. It was decided to recommend that all high-voltage fuse equipment be rated as to capacity in accordance with the N.E. Code requirement for 600-volt cartridge fuses. The "220-kv. Line Construction and Operation" sub-committees were the next on the program. A report on 220-kv. line construction and operation was outlined and some additional data given covering tests of insulators for 220-kv. service in fog areas.

Discussion of a 2-ft. vs. 4-ft. buck-arm clearance for primary and secondary arms took up most of the second day's sessions and resulted in the suggestion that a special study of field conditions be made by a committee composed of a Railroad Commission representative and two power company men. A brief outline of the work undertaken by the sub-committee on corrosion of steel towers and line hardware brought forth a decision to enlarge this subject to include conductor corrosion as well. Methods of gaining and roofing full-length treated poles brought out considerable discussion. A report on live-line tools and maintenance discussed several experiences in live-line work on lines of voltages as high as 78-kv.

Safety Rules Committee

By E. J. CRAWFORD

San Joaquin Light & Power Corporation, Chairman

This committee considered three important subjects.

1. Member company practices in testing and handling rubber protective equipment used by linemen were tabulated and discussed at length and a definite conclusion reached in the majority of cases. These will be tabulated and submitted in a final report for distribution.

2. The State Railroad Commission's tentative draft of proposed safety rules covering the operation of overhead lines was reviewed in detail. Member company opinions together with comments made at the Fresno meeting were noted for recommending changes in this draft.

3. The uniform electrical ordinance submitted by the California Electrical Inspector's Association was discussed and some objections made which will be transmitted to the ordinance committee of that association. In general the provisions were considered satisfactory and the legislative features recommended for adoption by the various county governments.

Contractors, Dealers and Inspectors

Uniform Ordinance Gets Hearty Endorsement at California Inspectors' Convention

AN UNIFORM ordinance, long dreamed and despaired of, now has a fighting chance to become a reality. The first momentous step was taken in the direction of standardized wiring requirements, for the state of California, at least, as a result of the endorsement and support pledged the uniform ordinance by the California Association of Electrical Inspectors in its sixth annual convention, held at the Hotel Leamington, Oakland, Calif., March 24-26. Although the uniform ordinance probably overshadows in importance the other activities of the convention, it must not be taken that other items of significance did not elevate this convention from the plane of "just another convention" into a realm of genuine worth and importance to the electrical industry.

From the opening of the convention on Thursday morning—promptly to the minute on scheduled time—Ben C. Hill, supervising inspector, Oakland, and president of the association, kept the 115 delegates busy. A minimum of time was set aside for entertainment, and that only at an evening banquet and a luncheon by the Oakland Electric Club, Friday. Every session period was crowded with discussion, either educational or of interest to the inspectors. The last meeting, on Saturday morning, was brought to a close reluctantly an hour or so after the noon hour. Each paper presented, every question asked or controversy opened drew forth intelligent comment and much worthwhile information. When the proceedings of the meeting are published next fall that volume will contain enough sound practical theory and reflect enough experience in the field of electrical construction and inspection to become a valuable reference work.

Northwesters Attend and Take Part

President Hill opened the first session Thursday morning introducing Commissioner Frank Colbourn of Oakland who welcomed the convention. In the absence of R. H. Manahan, chief, department of electricity, Los Angeles, and vice-president of the association, response to Mr. Colbourn's welcome was made by Carl E. Hardy, superintendent of the electrical department, Oakland.

In his report President Hill indicated that the electrical industry was looking to the inspector for an application of the slogan, "Let the code decide." He stressed the need for a standardization of local rules and regulations, which would come, he said, only through the co-operation of inspection departments throughout the state. Mr. Hill spoke briefly of the work of the Article 5 and of the closer co-operation between the two associations brought about by mutual contact recently. As evidence of the Northwest association's interest in the California association's work he introduced each of the Northwest delegates.

H. S. Jenkins, city electrician and inspector of Bellingham, Wash., and new president of the Northwest association, responded and outlined briefly the work of his association in Washington for a

R. H. MANAHAN
New president of the California Association of Electrical Inspectors.

8 committees for code revision, to which he had gone as representative of the California association. The code, he pointed out, was now in the process of complete revision and Western ideas and standards were needed in it. The work of the Northwest Association of Electrical Inspectors he praised and told state electrical code. Because the agitation for it had assumed a political aspect, he said, its passage had been retarded but efforts would be resumed to see it passed two years from now.

F. D. Webber, chief electrical engineer, Oregon Insurance Rating Bureau, and secretary of the Northwest association, spoke next, announcing the next convention in Seattle. He then urged eloquently the participation of both California and Northwest associations in the International Association of Electrical Inspectors, now in process of formation. The latter, he pointed out, would be a clearing house for code revision work and could present the crystalized opinion of the nation's electrical inspectors to the electrical committee, even as representatives of other organized groups in the industry may do now for their respective organizations.

E. G. S. Pryor, resident engineer, Underwriters' Laboratories, Seattle, followed Mr. Webber and urged co-operation between inspection organizations because of the similarity of problems affecting each group and the possibility for effective results, especially with the electrical committee, through team work.

A. A. Tobey, secretary of the Jaggar-Sroufe Company, electrical contractors of Portland, and active in support of the electrical inspectors' organization, was present also and voiced a greeting from the Northwest. Upon motion the officers and visitors from the Northwest association were tendered honorary membership in the California association.

Claude W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, San Francisco, and secretary-treasurer of the association, next made his report. He told of a gain in membership of 46, of whom 13 are active members, since the last meeting. He asked whether the bulletin on standards, recently issued, was wanted continued, and received an unanimously affirmative answer. The printing of the proceedings for this convention, he stated, would require the financial support of more supporting members, whereupon Mr. Webber reported a telegram from W. S. Canada, pledging support.

Uniform Ordinance Discussed

James M. Evans, Board of Fire Underwriters of the Pacific, Los Angeles, and chairman of the uniform ordinance committee, was then asked for a preliminary discussion of the proposed standard ordinance in order to give members present a basis from which to consider it before it should be brought up for action. He passed around copies and bierfly outlined the purpose of the ordinance as being five-fold.

The five sections of the ordinance, he showed, dealt with these five considerations, namey, *Inspection* itself, over which there was seldom much divergence of opinion; *Fees*, over which there was much—three methods being advocated, (1) where the inspector collected fees and had no check over him, (2) where the inspector collected fees and accounted for them completely, and (3) where the city clerk collected fees and paid the salary of the inspector from them; *Amplifying upon the code*, in which some communities wish to write into the ordinance all wiring requirements, practically writing into it the entire code, or on the other hand, making the ordinance as short as possible and including the code by reference; *Registration and examination of contractors, dealers, electrical workers, etc.*, upon which point some cities require bond of licenses and others do not, and just how much the bond should be; *Penalties* for violation of the ordinance, upon which much difference of opinion exists.

The uniform code presented to the association for its endorsement, Mr. Evans went on to say, had been a compilation and a compromise upon all of these points and presents the best average requirements available. Moreover on the question of legality, which always looms largely, in the uniform ordinance as it now stands, has been pronounced airtight by the law committee, all doubtful provisions having been deleted or changed so as to make them legal and capable of enforcement. The fees presented in the ordinance, he declared, are based on an average of the fees of 75 cities.

Over the suggested additions to the code, Mr. Evans said, the greatest difficulty arose. In this respect the various cities of the state now operate under ordinances sometimes widely different in their requirements. On these points an independent study of the requirements for safety were considered and rules established. Recent standards advocated by the Board of Fire Underwriters of the Pacific have been incorporated in these additions to the code.

Uniformity has been extended, he pointed

out, even to the matter of tags used by inspection departments at various stages of construction. The ordinance has already been adopted by a number of cities, he said, and other cities and several counties are withholding adoption of it pending the endorsement of the association.

Upon a point made by Carl Beaton, city electrician, Sacramento, Mr. Evans pointed out that the proposed uniform ordinance, in the manner in which it made reference to the code, was legal. Mr. Beaton had described a bill before the California State Legislature which would require the full printing of all codes, making reference to them illegal. In the uniform ordinance the use of the words "and with the most approved methods of construction for safety to life and property" and the submittal of the National Electrical Code and the rules and regulations issued by the Board of Fire Underwriters, State Accident Commission, etc., as prima facie evidence of such approved methods surmounts this difficulty. A noon recess closed the discussion until a later session.

Industry Representatives Speak

S. Waldo Coleman, president of the Pacific Coast Electrical Association, was the first speaker on the afternoon program, Thursday. His subject, "The Growth of the Electric Industry," gave him an opportunity to describe how far reaching were the activities of the industry, and to emphasize the strategic position in it occupied by the electrical inspector.

He recited figures showing the growth during the past ten years and the predicted growth for the next ten and concluded his remarks convincingly by emphasizing the necessity for sound judgment and constructive co-operation in order that the industry may advance to meet its predicted future.

"It has been said often that the power to tax is the power to destroy," he said. "It is also true that the power of regulation and inspection carries with it the power which can be used for destruction as well as development."

Mr. Coleman went on to show that the greater value of the so-called privately owned operation over government operation lay in the fact of independent and disinterested audit by an inspection body. "Under government operation we would have the same agency both in charge of work and responsible for seeing that it is living up to the rules and regulations which it, itself, has made," he pointed out.

M. A. DeLew, superintending electrical engineer, Associated Oil Company, followed Mr. Coleman with an illustrated talk on the importance of bonding of all metal apparatus and even buildings to a common ground wherever oil is being handled. He related a number of actual experiences in which a difference in potential between two buildings, or between a vehicle and a building, or a ship and a dock, had caused electrical discharges sufficient to ignite volatile gases or oils. Interesting and ingenious methods to insure the bonding together of all apparatus prior to the transfer of oil from one to another container were illustrated by Mr. DeLew by means of lantern slides.

Electragist Head Talks Plainly

Announcing that a national honor had been conferred upon a well known Californian in the appointment of Clyde Chamblin as president of the Association of Electragists, International, Ben Hill asked H. C. Reid, Electragist of San Francisco, to read Mr. Chamblin's paper to the convention.

Beginning his paper with the statement, "Mr. Mitchell said to leave out the 'applesauce' and to talk frankly, so here goes:" Mr. Chamblin went on to say that inspectors and contractors are beginning to believe each other human. He urged the inspector to mingle with all branches of the industry and to take part more in the activities of other branches. He asked that inspectors whenever possible disabuse the minds of many mechanics who think contracting simple and who know nothing of the costs of doing business, enter it blindly, men who cut prices and injure all branches of the industry until inexorable economics either overtakes them or teaches them better sense.

Regarding inspection Mr. Chamblin was very frank in declaring that there had been such an orgy of law and rule making that "between local, state and national rules the poor contractor is today in a precarious condition indeed. I challenge any inspector here assembled to go into any section of his city, under the jurisdiction of another inspector, and do an ordinary wiring job and not get a complaint." He ventured the opinion that the hazards of electricity were being greatly magnified. "Automobiles are killing thousands of people, but it is unlikely that rules to curtail their use will ever be enacted," he declared.

"This is no time or place for pet theories," he concluded, "but a time for broad minded, well balanced technical judgment, tempered with the thought that any rule or law that is economically unsound will eventually fail."

Challenging Mr. Chamblin's remarks regarding electrical hazards many inspectors rose to their feet. It was pointed out by Mr. Evans that a national survey of the fire underwriters,

North and south, as it were: Harry S. Jenkins, Bellingham, Wash., president of the Northwest Association, and Ben Hill, past-president of the California Association. Farthest South member, A. M. Proctor, from Chula Vista, in center background.

kept up to date, showed that 12 per cent of the fires in the nation were of electrical origin.

George Rankin, field representative for the California Electrical Bureau, Fresno, was the next speaker. He presented an unusually strong plea for inspection for small communities. As a Red Seal representative he described the inspection given by the bureau for such homes. The necessity for inspection in small towns or in county districts was apparent everywhere, he declared. He suggested that many small towns grouped about a center might well be covered by one inspector and that people would be glad to pay fees to support inspection which would insure them safety in wiring. The importance of re-inspection had been brought to his attention, he said, by a fire marshal who compared electrical inspection periodically to the inspection carried on by fire departments to see that oil, rubbish, rags and other hazards are removed.

Electric Heaters Discussed

Arthur Kempston, Apex Electric Heater Company, industrial member, after the conclusion of the formal program, spoke to the convention about the coming importance of electric heating. The electric refrigerator, he said, was bringing about a new realization as to the possibilities of electricity in the home, which will reflect in more serious attention being given to electric heating. He suggested especially a study of the subject of the bathroom heater of the wall inset type. A bathroom heater, because it will consume only a small amount of electricity to heat a small space, proves the satisfaction of electric heat.

He asked not only for uniform ordinances and rules, but uniform interpretation of those rules so that the manufacturer of electrical equipment could standardize on the equipment provided for the wiring of his apparatus. On controversial matters he suggested that the association establish policies as to the logical interpretation intended.

Carl Beaton, Sacramento, warned against the ungrounded bathroom heater, citing a casualty recently as an example. W. M. Kennedy, electrical inspector, Los Angeles, declared that the cost of current was the chief reason for a slow growth of electric heating. For grounding appliances, especially heaters, he advocated three-wire outlets and three-conductor cords. He blamed the electrical contractor for not doing a better selling job as respects wiring and appliance safety. On the same general subject Mr. Prior, of Seattle, warned the members to watch for a poor grade of No. 20 silk covered appliance cord of which, he said, millions of feet are being sold and used every year. John Wrenn, Great Western Power Company, described the work of the N.E.L.A. on cord investigation.

Banquet Talks Inspiring

Two speakers gave to the evening banquet, Thursday, the inspiration of the gathering. Following entertainment, arranged by C. D. Slaughter, Allied Industries, chairman of the entertainment committee, Lew Galbraith, commercial manager, Pacific Gas and Electric Company, Oakland, toastmaster of the evening, introduced Louis F. Leury, consulting electrical engineer of San Francisco.

Mr. Leury painted a word picture of the electrical industry, into which as an organization the inspectors had come a little late. A great industrial empire has been formed as a consequence of the industry's work. So great a force electricity has become, said Mr. Leury, that we have come to "wonder if man can ever master the forces he himself has unleashed." The problem of the future, he went on to explain, is, "how is man going to live up under it?" He quoted from H. G. Wells, who wrote recently that civilization was engaged in a race between education and disaster.

"Man to man force is the greatest educational factor," Mr. Leury continued. The industry must seek means of interpreting itself to the people it serves, and the inspectors should face the responsibility falling to them, that of interpreting between the power companies and other branches of the industry and the people.

Clark Baker, after an elaborate and humorous introduction by Toastmaster Galbraith, continued on a humorous vein interweaving into his talk something of the aims of the illuminating division of the industry in the preservation of eyesight.

Friday's Sessions

The morning session, Friday, opened with a description and technical explanation of the Neon sign and a demonstration of it, given by Ralph B. Wright, Electrical Products Corporation, Oakland, assisted by L. A. Rice, superintendent of the same company. This presentation was followed by consider-

able discussion as to the possible hazards in the use of high voltage as with this sign.

W. M. Kennedy, electrical inspector, Los Angeles, was the next speaker. He read a paper on the enforcement of electrical ordinances.

The methods of enforcing he listed as: cutting off current, and bringing a complaint to court against the offender. The first method is detrimental to industry and is to be avoided, except in residence cases. In bringing a case to court photographic evidence of the infraction was decided best since it can better be shown to a jury in that form. Conduct of business without a license he characterized as hazardous to the community. Educational work with the public was necessary, he pointed out. Of the fires in Los Angeles he cited figures to show that 17 per cent had been due to electrical causes. A close follow up on fires to see that new work installed after a fire complies with regulations is important, he maintained.

Uniform Ordinance Endorsed

Continued discussion on the uniform ordinance was interrupted only by the noon hour and a luncheon given the convention delegates by the Oakland Electric Club at the Elks Club Building, Robert Prussia, president of the Electric Club, presiding.

After some controversy as to the advisability of including certain portions and amending others, a motion was made for the endorsement of the uniform ordinance with the sections stricken out dealing with standards for wiring to supplement the code. These were withdrawn by the committee on the ordinance after an agreement with the Board of Fire Underwriters of the Pacific that it would publish these supplemental regulations as Pacific Coast requirements. In this way, according to the wording of the uniform ordinance, they would be included by reference as "best approved methods." This strategic coup removed the objection to including the extra standards and simplified the ordinance. At the same stroke, however, these requirements will be made a part of the ordinance as soon as published by the board.

The section dealing with licensing and bonding and examinations of electrical contractors and dealers was omitted and will be submitted as an optional clause to the ordinance, to be adopted or not according to the desires of each particular city.

George Kimball, electrical engineer, Industrial Accident Commission of California, in a dramatic recital of an electrical accident in which no one was prepared to give proper resuscitation, introduced S. C. Dickinson, safety engineer, Pacific Gas and Electric Company. Mr. Dickinson gave a simple yet complete description of the Schaefer prone pressure method of resuscitation, followed by an actual demonstration.

Following this the amendments to the constitution of the association were considered and passed. Article committees were called on for reports, most of them excusing themselves on account of the revision work being carried on on the National Electrical Code. H. W. Stitt, city electrician, Fresno, made a strong plea for the elimination of the word "recommend" from the code, since upon it cases have been lost in court.

Claude Mitchell made a report of the meeting of the Electrical Committee in New York recently to decide upon code revisions. The action of the committee, he reported, was that there would be no 1927 code, but that further study and investigation would be conducted with a view to action next year. The volume of the work necessary made it impractical to consider from all angles all the revisions suggested by the article committees.

Mr. Webber, also in attendance at the electrical committee meeting, spoke of the surprise and shock caused the committee when the representatives from

C. J. GEISBUSH
Elected state manager for the California Electragists

the Northwest association had declared the present code inadequate for Pacific Coast needs. Action was taken by the association in naming Ben C. Hill, the retiring president, as the chairman of a clearing house committee on code matters for the California association.

Officers Named

The nominating committee brought in its report, which was unanimously accepted and the officers elected for the coming year.

R. H. Manahan, chief, department of electricity, Los Angeles, was named president; J. C. Hamilton, city electrician, San Jose, vice-president; C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, San Francisco, secretary and treasurer. To the board of directors were named B. C. Hill, supervising inspector, Oakland, and C. R. Mikel, electrical inspector, Bakersfield, as active members; C. P. Murphy, district plant superintendent, A.D.T., San Francisco, as associate member; J. J. Farley, electrical contractor, Fullerton, as industrial member, and R. A. Schmidtt, manufacturer, as supporting member.

Santa Barbara was chosen as the next convention place, March, 1928.

Saturday Morning Session

The question box and other routine matters concerned the convention in its last session, Saturday morning. A total registration of 115 was reported, of which 38 were active members, nearly half of the active membership of the association. Claude Mitchell was presented with a handbag by the individuals of the association in appreciation of his work as secretary. A question as to diversity factors in the proposed regulations to accompany the uniform ordinance was withdrawn upon investigation of the tables in reference to diversity statistics presented by Rollin Smith, editor of "The Wiremen's Handbook," and E. J. Crawford, assistant general superintendent, San Joaquin Light & Power Corporation. Considerable discussion arose over possibility for injury from terminals to electric heaters covered by grill work and over the approval of the Underwriters Laboratories on devices before being allowed on the market.

A number of resolutions was submitted by the resolutions committee, consisting of Arthur Kempston, J. C. Hamilton, and George Kimball, and approved by the convention. The first was directed to the Industrial Accident Commission, commending it upon its reappointment of Frank Short as Los Angeles representative. Another extended sympathy to R. A. Schmidtt, newly elected director, due to illness preventing his presence at the meeting. A third asked the Underwriters Laboratories to take steps to label all devices and materials approved by them so that approved apparatus might be recognized easily. A fourth commended the electrical committee on its willingness to consider revisions to the code and its expressed desire to co-operate with Western inspectors. Other resolutions were made to commend W. J. Canada, field representative, N.F.P.A.; the Oakland Electric Club for its luncheon, and the hotel management. A final resolution was directed to the supervisors of Contra Costa County, commending them upon their intent to adopt a county electrical ordinance and urging its early adoption.

Other committees appointed were as follows: *Nominating committee*—H. W. Stitt, chairman; Frank Morrell, Stockton; V. W. Hannum, Anaheim. *Convention place*—R. Edwards, Santa Barbara, chairman; Walter Scott, Burlingame, and F. C. Colville, San Leandro. *Uniform Ordinance committee*—James M. Evans, chairman; James McConahey, Los Angeles, and O. Barnwell, Beverly Hills.

California Electragists Name Cy Geisbush as State Manager

In order to more closely co-ordinate the work of the Northern and Southern Divisions of the California Electragists and to bring into northern California something of the organization work which has distinguished the southern group, the executive committee of the California Electragists, at a recent meeting, named C. J. Geisbush as state manager. Mr. Geisbush has been executive secretary of the Southern Division since its inception. Earl Browne, general manager of the San Francisco Electrical Contractors and Dealers Association, at the same time was named office manager for the state association.

In company with George Eldridge, field representative for the Northern Division, Mr. Geisbush will make a swing of the northern territory during May and June, bringing the first lesson in estimating to each of 16 cities. The cities chosen are at convenient centers to which electrical contractors from surrounding towns will be invited. A strong program of individual local organization work is to be instituted as a result of these meetings wherever interest warrants. Special work to co-ordinate the activities of the California Electrical Bureau with those of the Electragists will also be undertaken.

The itinerary of the estimating classes has been announced by Manager Geisbush as follows: **May 2**, San Luis Obispo; **May 4**, Watsonville; **May 6**, San Jose; **May 9**, Redwood City; **May 11**, Santa Rosa; **May 12**, San Rafael; **May 13**, Martinez; **May 16**, Napa; **May 18**, Marysville; **May 19**, Corning; **May 24**, Sacramento; **May 25**, Stockton; **May 27**, Modesto; **June 1**, Fresno; **June 2**, Visalia, and **June 3**, Bakersfield.

Meetings

Coming Events

Association of Electragists, International.—Annual convention at Hotel Chase, St. Louis, Mo., Aug. 8.

National Electric Light Association—Annual Convention, Atlantic City, N. J., June 4-10.

Northwest Electric Light and Power Association.—Annual Convention, Salt Lake City, Utah, June 21-24.

Pacific Coast Electrical Credit Association—Annual conventoin at Hotel Del Monte, Del Monte, Calif., May 29-30.

Pacific Coast Electrical Association.—Annual Convention, Casa del Rey, Santa Cruz, Calif., June 14-17.

Pacific Division, Electrical Supply Jobbers Association.—Convention at Hotel Del Monte, Del Monte, Calif., May 26-28.

Rocky Mountain Division, N.E.L.A.—Colorado Public Service Association.—Joint annual convention at Colorado Springs, Colo., Oct. 17-20.

Westinghouse Agent-Jobbers' Association.—National convention at Hotel Del Monte,, Del Monte, Calif., May 23-27.

Portland Company 20-Year Club Holds Annual Election

The Twenty-Year Club of the Portland Electric Power Company, Portland, recently held its fourth annual meeting and elected the following officers: president—T. W. Sullivan, hydraulic engineer; first vice-president—R. R. Robley, operating engineer; second vice-president—E. G. Jarvis, manager investment department; secretary-treasurer—H. C. Schade, investment department; and trustee—Joseph F. Roach, assistant superintendent interurban lines.

The club is composed of employees that have been in the service of the company and its predecessors for twenty years. Forty-seven new members, who had become eligible during the year just past, were admitted and were presented with the twenty-year service button during a ceremony presided over by O. B. Coldwell, vice-president and general manager. The club now has a membership of 325.

Sales Promotion Plans Explained by Officials on Tour

To outline sales promotion plans and advertising programs for the year, officials of the Edison Lamp Works, General Electric Company and Pacific States Electric Company, recently completed a tour of the Northwest and Pacific Coast, holding meetings in all the important centers of the territory.

The programs were presented by the following Eastern officials: G. C. Osborn, general sales manager, A. L. Powell, manager engineering department, and H. F. Barnes, publicity department, all of the Edison Lamp Works, Harrison, N. J., and A. L. Atkinson, manager publicity department of merchandising division, General Electric Company, Bridgeport, Conn. D. E. Harris, president, Pacific States Electric Company, San Francisco, and F. W. Rea, advertising manager of the same company, met the party in the North and accompanied it on the tour.

At the two sessions held in San Francisco R. M. Alvord, district manager for the General Electric Company, presided, while in Los Angeles S. E. Gates, district manager of the General Electric Company in that city, was chairman of the afternoon session, and Frank Airey, Los Angeles, manager of the Pacific States Electric Company, had charge of the evening meeting. In each of those cities Mr. Powell spoke at a meeting of The Illuminating Engineering Society.

Convention of Pacific Division, Electrical Supply Jobbers Association, Set for May 26-28.—Announcement has been made by Albert H. Elliot, secretary of the Pacific Division, Electrical Supply Jobbers Association, San Francisco, that that division will hold its convention at the Hotel Del Monte, Del Monte, Calif., May 26-28, 1927. Those dates have been set to accommodate those members of the association who wish also to attend the national convention of the Westinghouse Agents-Jobbers' Association, to be held at the Hotel Del Monte May 23-27. Mr. Elliot asks that reservations be made promptly as a large crowd is anticipated at the hotel during that week.

Northern Counties Electrical Development League of California Announces 1927 Officers.—Officers of the Northern Counties Electrical Development League of California elected for 1927 are: president—A. D. Woods, Redding; vice-president—H. A. Boblet, Chico; secretary-treasurer—J. T. Hughes. The directors are A. Libhardt, Willows; Don Bird, Chico; J. Thackery, Red Bluff, and Tom Woods, Redding.

Refrigerator Trades Association Formed in San Francisco

At a recent meeting the San Francisco Electrical Refrigerator Trades Association was formed and the following officers elected: president—O. A. Brandel, Kelvinator sales manager for Leo J. Meyberg Company; vice-president—George A. Campe, distributor Copeland refrigerators; secretary-treasurer—O. F. Boyer, Servel Corporation.

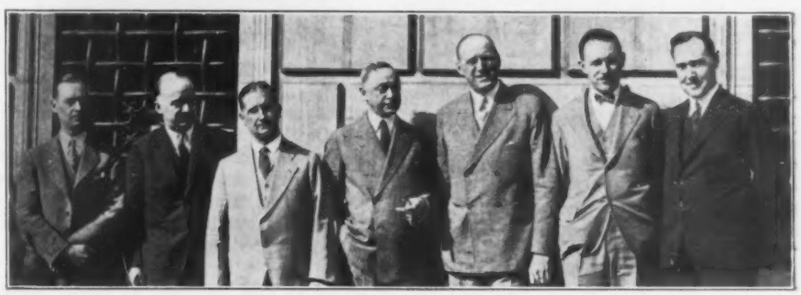
In addition to the officers those present included W. L. McKee, C. R. Hyde and H. R. Jones, of the Wayne Company; W. L. Wyatt, Servel Corporation; S. E. Pentz, of Listenwalter & Gough, representing Copeland Products, Inc.; B. M. Stern, refrigeration engineer; R. T. Stephens, Pacific Gas and Electric Company, and Victor W. Hartley, California Electrical Bureau.

The officers elected are to meet for the purpose of preparing a code of ethics and a constitution and by-laws to present for the approval of the members at the next meeting, which will be called by the president as soon as the officers have completed their work.

There was considerable discussion regarding the purpose of the organization, which was agreed to be two-fold in its nature—first, for unification for strength in legislative matters, either in the proposal of desirable legislation, or the combating of adverse legislation; and, second, as a common meeting ground for the exchange of ideas upon subjects of mutual interest.

Westinghouse Agent-Jobbers to Convene at Del Monte, Calif., May 23-27.—The annual meeting of Westinghouse Agent-Jobbers' Association will be held at the Hotel Del Monte, Del Monte, Calif., May 23-27, 1927. All meetings will be closed except that of Friday evening, May 27, which will be a "guest meeting."

Credit Association to Convene.—The Pacific Coast Electrical Credit Association will hold its twenty-fifth annual convention May 29-30 at Hotel Del Monte, Del Monte, Calif.



(Left to right): F. W. Rea, advertising manager, Pacific States Electric Company, San Francisco; J. F. Reinke, Northwest manager, Edison Lamp Works, Portland; A. J. Lutz, Seattle manager, Pacific States Electric Company; D. E. Harris, president, Pacific States Electric Company, San Francisco; A. L. Atkinson, manager publicity department of merchandising division, General Electric Company, Bridgeport, Conn.; H. F. Barnes, publicity department, and A. L. Powell, manager engineering department, both of the Edison Lamp Works, Harrison, N. J.

Personals

R. A. Sharon, for the past two years assistant sales manager for the Great Western Power Company, San Francisco, has been appointed assistant to the vice-president and general manager of that company. Mr. Sharon was gradu-

R. A. SHARON

ated from Yale University in 1912 with a degree in electrical engineering and entered the employ of the City Electric Company, San Francisco, as an industrial power salesman, remaining in that position until his enlistment in the army in 1918. Upon his discharge from the service, in which he received a commission as second lieutenant in the Air Service, Mr. Sharon joined the sales force of the Standard Oil Company at Portland, Ore. He was promoted to the position of service station superintendent at Seattle for that company and later held a similar position at Sacramento. He then was made city sales superintendent for the Standard Oil Company at Bakersfield, a position he held at the time he entered the employ of the Great Western Power Company.

P. L. Thomson, publicity director, Western Electric Company, New York, has been made president of the Audit Bureau of Circulations and chairman of the board, succeeding **O. C. Harn** of the National Lead Company, who has become managing director.

Roderick McRae, formerly superintendent at Lewiston, Idaho, for the Pacific Power & Light Company, Portland, has been appointed district manager at Hood River, Ore., succeeding **H. E. Baker,** who has been transferred to the power department of the company with headquarters at Clarkston, Wash.

H. E. Strang, oil circuit breaker designer in the switchboard engineering department of the General Electric Company, Schenectady, N. Y., is spending two months on the Pacific Coast in making a survey of oil circuit breaker applications and possibilities.

E. J. Mehren, a vice-president of the McGraw-Hill Publishing Company, and chairman of its editorial board, sailed April 20 from New York to attend the International Economic Conference at Geneva scheduled to open May 4. Mr. Mehren will send to the McGraw-Hill papers special reports on his observations of the proceedings as they affect industry and engineering.

J. F. Reinke, for many years associated with the Northwest office of the Edison Lamp Works of the General Electric Company, having his headquarters in Seattle, has been appointed to the position of Northwest manager for the company, Portland, succeeding **Jack Hampton,** whose death occurred Feb. 19.

J. C. McQuiston, manager publicity department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, who has been making a tour of the country, recently visited Pacific Coast cities. Mr. McQuiston has been connected with the Westinghouse company for the past thirty years.

C. L. Lewis, general manager of the Electro-Kold Corporation, Spokane, has been making a two months' survey of the refrigeration field in California.

A. O. Marston, executive secretary of the Los Angeles Electric Club, has resigned to join the staff of the Harry H. Culver Company as manager of the establishments department.

Glenn L. Jackson, recently appointed general sales manager, Mountain States Power Company, Albany, Ore., to succeed **F. L. Brewer,** resigned, has been connected with that company since his

GLENN L. JACKSON

graduation from the Oregon Agricultural College in 1925. He was born in Albany and received his early schooling there. After graduation from college he joined the Mountain States organization as salesman at Albany, and later was transferred to Marshfield, Ore., in the same capacity. In April, 1926, he was promoted to be division sales manager of the Casper, Wyo., division, and in January, 1927, on the resignation of Mr. Brewer, he was promoted to be general sales manager with headquarters in Albany.

Charles Stevens, manager of the Pacific Telephone & Telegraph Company, San Diego, Calif., has been elected president of the San Diego Electric Club, succeeding Ray C. Cavell. Mr. Stevens was born in Wolfs, Ohio, in 1887, but most of his early years were spent in St. Louis. His first experience in electrical work was with the St. Louis Sign Company, helping to make and install some of the largest signs in that city. He then entered the electrical fixture business and was connected with

CHARLES STEVENS

the St. Louis Brass Manufacturing Company for about three years. In 1913 Mr. Stevens arrived in California and became affiliated with the Pacific Telephone & Telegraph Company in San Diego, later being transferred to the nearby city of Escondido where he remained as local manager until 1916. At that time he reurned to San Diego as chief clerk. Upon returning from the air service at the expiration of the war he was placed in charge of the sale of securities for the telephone company and held that position until January, 1926, when he was appointed manager. Mr. Stevens has been an active member of the Electric Club since its inception several years ago. He was secretary-treasurer in 1924 and vice-president in 1925.

O. H. Caldwell, editor of Electrical Merchandising and Radio Retailing, New York, has been given a recess appointment as a member of the Federal Radio Commission recently created by Congress to supervise and control the operation of broadcasting stations. Mr. Caldwell has been granted a year's leave of absence by the McGraw-Hill Publishing Company, Inc., in order that he may devote his entire time and attention to the work of the commission.

Obituary

Charles B. Leonard, founder of the Leonard Refrigerator Company, died in Grand Rapids, Mich., March 22, at the age of 79.

Manufacturer & Distributor

Electro-Kold Company Adds Two New Products to Its Line

Production of a two-cylinder, air-cooled compressor, driven by a 1-hp. motor to supply 20 separate frost tanks for apartment houses is now under way at the newly enlarged Electro-Kold factory, Spokane. The machine has a refrigerating capacity of one-half ton of ice. A feature of the factory enlargement has been the allotting of six times the amount of floor space to the cabinet department as was formerly used by that department. A further innovation to the line is a new frost tank without ice trays for commercial purposes.

The apartment house field is the most rapidly growing market for the company's product, according to C. L. Lewis, general manager. The company recently has issued a new advertising folder covering its multiple control line for apartment houses.

The Chicago Fuse Manufacturing Company, Chicago, has removed its San Francisco office from 303 Rialto Building to 226 Chronicle Building. **A. W. Rockwell** is district sales manager. **W. W. Merrill,** president of the company, accompanied by Mrs. Merrill, recently made a tour of the Pacific Coast and the Northwest.

Fairbanks-Morse & Company, Seattle, has named as manager of its Portland office **W. J. McIntosh,** who has been manager of the electric motor and hydraulic department of the company's Seattle branch. **H. S. Emanuels** will succeed Mr. McIntosh in Seattle.

The Servel Corporation has taken over the selling of its product in the Mountain States territory with division offices in Denver and a district office in Salt Lake City. **W. B. Milliken** is the business manager.

Trico Fuse Manufacturing Company, Milwaukee, Wis., has announced that **Arthur E. Bacon,** Denver, Colo., has been appointed sales representative for the states of Colorado, New Mexico, Utah and Wyoming.

C. F. Braun & Company, Alhambra, Calif., has opened a sales and engineering office in the French Building, 551 Fifth Avenue, New York City, with **William D. Moorer** as manager.

The Globe Electric Supply Company, Denver, is handling the Coldak refrigerator in that territory, according to announcement of **Paul A. Douden,** president of the company.

Fobes Supply Company has announced the transfer of **Roy D. Constable** from its San Francisco branch to its Oakland branch where he will cover the East Bay district in electrical and radio lines. Prior to his removal to California Mr. Constable was connected with the company's Seattle branch for eight years.

W. I. Otis and **A. H. Holterman,** manufacturers' agents, formerly situated, respectively, in the Rialto Building and at 89 Market Street, San Francisco, have announced that they jointly will occupy quarters in Room 226, Chronicle Building.

The R. Thomas & Sons Company recently held a sales and engineering conference at its home office in East Liverpool, Ohio. Sales meetings were interspersed with engineering sessions, thus maintaining high interest throughout the week, it is reported. Among Western men in attendance at the conference were **H. J. Billica,** Seattle, and **J. E. Crilly,** San Francisco.

Electrical Engineering Sales Company is the new name of the **Special Service Sales Company,** California agent for the **Morganite Brush Company, Inc.,** Long Island City, N. Y. Offices will continue to be maintained at 222 Underwood Building, San Francisco, and 502 Delta Building, Los Angeles.

I. H. McCarty, formerly manager radio department of **Levenson Company,** San Francisco, has resigned to engage in business for himself under the name of **"Radio Mac"** at 350 Market Street in that city. He will handle radio equipment and electrical appliances.

The James R. Kearney Corporation, St. Louis, has appointed **Maydwell & Hartzell, Inc.,** of San Francisco and Los Angeles, factory representatives for the states of California, Nevada and Arizona.

Samuel P. Williams, for the last five years secretary of the **Hart & Hegeman Manufacturing Company,** Hartford, Conn., has been elected president and treasurer of that company to succeed the late Shiras Morris.

The American Electric Switch Company, Minerva, Ohio, has appointed **James J. Noble Company,** 915 Bryant Street, San Francisco, as its Pacific Coast representative. Warehouse stocks will be carried in San Francisco.

Coast Firm Named as Agent for American Brown Boveri Co.

An announcement of much interest to the electrical industry on the Pacific Coast is that of the appointment of **Garland-Affolter Engineering Corporation,** of Seattle, San Francisco and Los Angeles, as Pacific Coast representatives of **American Brown Boveri Electric Corporation** (an American Company), with headquarters in New York.

Among the products handled will be steam turbo-generators, transformers, oil switches, Mercury-Arc power rectifiers, automatic regulators, electric locomotives, and complete equipment for railway electrification.

Recent Publications

Deceleco Factory-Made Bus-and-Switch Cell Structures.—This is the title of Catalog No. 1, 1927, published by **Deceleco, Inc.,** Wayne, Mich. The foreword explains that it is the aim of Deceleco, Inc., to introduce all over the world some standard units of bus and switch cell structure of which any type of cell structure can be built at a minimum of cost and inconvenience. The foreword continues: "To this end we are supplying the market with factory-made cell units or slabs of various standard dimensions but of uniform thickness." The rest of the catalog is given over to the statements of the advantages of the use of the Deceleco cell structure and to descriptions and illustrations of the construction of the units and various applications.

Wild-Barfield Small Electric Furnaces for Laboratories and Works.—This is the title of a new sectional catalog published by the **Automatic & Electric Furnaces, Ltd.,** 173-175 Farringdon Road, London, E. C. 1. It deals with general purpose furnaces, electric crucible furnaces, laboratory tube furnaces, temperature regulators and control panels, and pyrometers.

Condulets.—**The "New Obround Condulets"** is the title of catalog No. 2100 published by **Crouse-Hinds Company,** Syracuse, N. Y. Large plates illustrating the applications of these condulets are a particularly fine feature of the catalog.

Shrink-Fit and Soldered Pipe Connectors for High-Tension Conductors.—These are described in leaflet issued by the **Burndy Engineering Company, Inc.,** 10 East 43d Street, New York.

Test Blocks.—Section 9-A of Perpetual Catalog No. 1 describes Type "S" Test Blocks manufactured by **The States Company,** Hartford, Conn.

New Equipment

Peak Limiter

Hotpoint Peak Limiter, Model Y121, is being offered by the **Edison Electric Appliance Company, Inc.,** Chicago, as its contribution toward the more rapid building up of water-heating load.

In the words of the company's announcement, this device is intended for connection into the circuit supplying a range and acts to disconnect the water heater automatically whenever the range load exceeds about one kilowatt. By thus preventing the load of the two devices occurring simultaneously, smaller wiring is permissible, smaller meters and transformers may be used, and the domestic load factor is substantially improved. Little complication in wiring is required to install the Peak Limiter, as it is intended to be installed at the entrance switch in the same manner as the usual watthour meter. From this point the circuits usually branch to the range and water heater so the Peak Limiter can be installed easily even in existing installations. Seals are provided so the electric service company may install and seal the device to prevent tampering.

New Model Washer

Among the improvements offered by the **Meadows Manufacturing Company,** Bloomington, Ill., in its new Model H washing machine, attention is directed

by the manufacturer to two, the Bakelite 6-vane impeller and the Udylite square steel tub.

Among the advantages claimed for the impeller construction are: impossibility of tearing the clothes, facility of moving clothes away from the agitator, and frequency of change in the relative position of the clothes. The 23-gal. steel tub is coated with Udylite by an electrolytic process which deposits a coat of cadmium forming a chemical union with the steel and over the outer surface, entirely eliminating rust, according to the announcement of the company, and the generous rounded corners of the bottom are necessary to direct the water upward on the outside and downward in the middle in order to direct the clothes into and out of the agitator vanes and subject them to the cleaning currents of water from the middle.

Three-Circuit Switch

A 3-circuit switch which fits a single-gang outlet box and takes a single-gang flush plate is being placed on the market by **The Bryant Electric Company,** Bridgeport, Conn.

This is an entirely new tumbler device, according to the company, that

consists of three single-pole individually controlled switch mechanisms with common feed mounted in one porcelain cup. It has three indicating black composition handles centered vertically on a single-gang flush plate. This switch may be used as a 3-circuit electrolier switch, that is, for controlling three separate circuits with common feed.

Kelvinator Incorporated, 2078 West Fort Street, Detroit, has just announced the introduction of a new model **Cabinet Kelvinator,** known as the Sealtite, which is said to be the last word in electric refrigerator construction. This new model has a cabinet of all-steel exterior and is insulated with 2 in. of corkboard. It is finished in Kelvinator gray lacquer. The freezing unit uses the regular Kelvinator tank construction and has all of the features found in standard Kelvinator units. There are two trays for freezing ice cubes and delicacies. The condensing unit is claimed to be very efficient and compact and is so light in weight that it can be lifted by one man without difficulty. A 1/6 hp. motor is used. The outside dimensions of the cabinet are: height, 56⅛ in.; width, 26½ in.; depth, 22½ in. There is nearly 5 cu.ft. of food storage space, and the shelf area is approximately 7 sq.ft. The unit is said to consume little current, making operating cost very low. This model has been designed particularly for use in apartments and homes of the smaller type.

New Model Non-Oscillating Fan

Among the new models added to its line of electric fans for 1927 by **The Robbins & Myers Company,** Springfield,

Ohio, is the 8-in. model 50 induction type non-oscillating fan shown in the illustration.

Advanced Bulletin No. 1318 describes this fan as being finished in baked black enamel, steel blades, black satin, with an induction motor of an efficient shaded pole type, drawn steel frame and mounted on cast-iron base, having felt strip on bottom of flange. The fan also has single-speed toggle switch mounted on the rear head to serve for convenient starting and stopping.

Miniature catalog Form No. 1302 gives complete descriptions and illustrations of the fans manufactured by this company and may be obtained upon request.

A domestic refrigerating set known as the **Ice-O-Lator,** manufactured by the **Winchester Repeating Arms Company** for the **National Refrigerating Company,** New Haven, Conn., now is being offered to the public. The Ice-O-Lator operates on the absorption system and therefore requires no motors or compressors and has no moving machinery of any kind. The absence of moving machinery insures silent operation at all times and practically eliminates servicing, it is claimed by the company. The Ice-O-Lator consists of a refrigerating unit installed in the cabinet and a generating unit in the cellar or elsewhere. The refrigerating unit carries trays for producing ice cubes. An electrical heating element operates the generating unit but both electric and gas-operated models are available.

A complete line of **air heaters,** known as Slyker heaters, suitable for use in heating buildings, has been placed on the market by **Schleicher, Inc.,** Gary, Ind. The heater operates on the convection principle, and practically all of the heat input in the form of electrical energy is converted into warm air which rapidly circulates through the heater, according to the manufacturer's announcement. Standard ratings are 660, 1,000, 1,200, 2,400 and 4,800 watts, and standard finishes are walnut and white but the heaters can be supplied to match any color scheme. Bulletins describing the full line of Slyker heaters may be obtained upon request.